

AWRMS Environmental Maintenance Management Plan 2025

City of Cape Town

Submission date: 2025/12/05



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Project Overview and Purpose of the EMMP

New Water Programme: Atlantis Water Resource Management Scheme

The Department of Environmental Affairs and Development Planning (DEA&DP) issued the City of Cape Town (CCT) with a Directive on 30 May 2017 (Ref no: 16/6/A7/4/3128/17), in terms of Section 30A of the National Environmental Management Act (NEMA) Regulations, 2014 (as amended), to address the emergency that arose due to severe drought conditions and ensure adequate water supply within the jurisdiction of the CCT. This was supported by the (then) National Department of Environmental Affairs (DEA) [now Department of Forestry, Fisheries and the Environment (DFFE)], who issued a Section 30A Directive on 12 April 2018 (Ref no: 14/7/6/4/2/6/25). The Directives authorised the CCT to commence with NEMA Listed Activities, for water augmentation projects (e.g., sea water desalinisation, water re-use, and ground water abstraction) under the New Water Programme, without the need to undertake an Environmental Impact Assessment (EIA) process. In addition, a local state of disaster was declared by the CCT in March 2017. This local state of disaster was extended monthly up until the end of September 2019 by notice in the Provincial Gazette.

Climate modelling indicates that the CCT and Western Cape Province will be very vulnerable to more frequent and extreme droughts in the future. In response, the CCT has developed a New Water Strategy to guide the provision of water services. The draft strategy was made available for comment in February 2019 and approved by Council in May 2019.

The emergency measures being developed as part of the New Water Programme comprised *inter alia*, the upgrading of the Atlantis Water Resource Management Scheme (AWRMS). The AWRMS is a managed aquifer recharge scheme where treated wastewater and storm water is diverted to large basins where it infiltrates into a sandy aquifer, whereafter it is abstracted and reused for municipal supply of water (DWS, 2010).

The infrastructure that forms part of the AWRMS requires regular maintenance (the purpose of this plan), and upgrades / refurbishments which are being completed under a different authorisation.

Environmental Maintenance Management Plan: DFFE Ref: 2024-09-0010

Zutari (Pty) Ltd has been appointed by the applicant, the CCT, to undertake the environmental authorisation process for the repair and maintenance of existing access roads, bridges, culverts, basins, pipelines, pump houses, reservoirs, weirs and borehole infrastructure (powerlines and telecommunication systems) within the sensitive terrestrial ecosystems, watercourses and wetlands of the AWRMS. Refer to Appendix A.7 for the identification of the affected infrastructure, the properties and the co-ordinates where the repair and maintenance works will be undertaken.

The proposed repair and maintenance¹ activities to the existing infrastructure triggers Listed Activities in terms of the NEMA, 2014 EIA Regulations (as amended) and approval for such activities must therefore be sought from the Competent Authority i.e., DFFE.

As per the 2014 EIA Regulations (as amended), authorisation for the Listed Activities triggered in this regard can be obtained via an **Environmental Maintenance Management Plan (EMMP) – this document**.

The purpose of the EMMP is to ensure that the environmental impacts of the proposed maintenance activities are managed, mitigated, and kept within permissible limits.

¹ **Maintenance** in the context of this document means routine or emergency actions performed to keep a structure or system functioning or in service in the same location, capacity and footprint.

This EMMP has been compiled with the multi-disciplinary inputs from various specialists: (i) Freshwater (Appendix C) (ii) Biodiversity (Appendix D) and (iii) Heritage (Appendix E).

This EMMP document stands as an internal record to guide all future operational maintenance activities pertinent to specific identified locations. The EMMP should be updated / amended as appropriate when new interventions are required. An internal review of the EMMP must take place at least once per 5² years to ensure that the most up to date and environmentally sustainable best practice methods are being employed to achieve the required intervention objectives.

This EMMP is considered a working document which, through monitoring and recommendations made by an Environmental Control Officer (ECO) and, on occasion, the relevant specialist ecologists, must be updated/changed where relevant.

The following overarching management principles have been considered for the development and implementation of this EMMP:

- (a) The anticipation and prevention of negative impacts and risks, then minimisation, rehabilitation or 'repair', where a sequence of possible mitigation measures to avoid, minimize, rehabilitate and/or remedy negative impacts has explicitly been considered;*
- (b) Avoid and reduce unnecessary maintenance;*
- (c) Maintenance and management of a watercourse have been informed by the condition of the physical and ecological processes that drive and maintain aquatic ecosystems within a catchment, relative to the desired state of the affected system;*
- (d) Management actions aim to prevent further deterioration to the condition of affected aquatic and terrestrial habitats and were overall guided by a general commitment to improving and maintaining ecological infrastructure for the delivery of ecosystem services;*
- (e) Managers and organs of state identified, addressed and, where feasible, eliminated the factors that necessitate intrusive, environmentally damaging maintenance; and*
- (f) A process of continuous management improvement will be applied, namely Planning; Implementing; Checking (monitoring, auditing, determine corrective action) and Acting (management review).*

This document will be submitted to DFFE in electronic format for their records addressed to the case officer.

² Environmental implementation plans and **management plans** (1) Every national department listed in Schedule 1 as exercising functions which may affect the environment and every provincial department responsible for environmental affairs must prepare an environmental implementation plan within five years of the coming into operation of this Act, and at intervals of not more than five years thereafter (NEMLAA: National Environmental Management Laws Amendment Act, 2022, proclaimed).

Using this Document

Sections 1 – 2 of this EMMP provide the background, project description and relevant legislation and policies. Refer to Table 1 for the requirements of an EMMP.

Section 3 provides the location and a summary of the present condition of the system and any applicable environmental or heritage context.

Section 4 contains the tasks of the implementation of the EMMP.

Section 5 provides the environmental management requirements for the maintenance and repair activities associated with the Steenbras Nature Reserve and Steenbras Wellfield

Section 6 provides the environmental and reporting requirements.

Table 1 DFFE: Minimum Required information to be contained in the EMMP³

Requirements - DFFE		Section
1	Details of the responsible party who will implement the EMMP.	Chapter 1: Table 3
2	Details of the EAP who prepared the EMMP; and the expertise of the EAP to prepare an EMMP, including a curriculum vitae.	Chapter 1: Table 4
3	Details of specialists or engineers appointed and the terms of reference of their studies to assess the needs for the maintenance work.	Chapter 1: Section 1.2 and Appendix C2 and D4
4	Listed or specified activities, which will be excluded from the requirement to obtain Environmental Authorisation, by the adoption of the MMP submitted to the CA.	Chapter 2 Section 2.1.1
5	The need for the development of the EMMP and what it will achieve.	Project overview and purpose, Section 1.1 and 1.2 and Chapter 3
6	The nature of the maintenance/remedial work to be undertaken.	Section 1.3.2 Chapter 5 and Appendix H.1
7	The impact of the maintenance/remedial work on the receiving environment.	Chapter 3 and Chapter 5
8	Specialist input/studies and the Declaration of Independence for each specialist.	Chapter 3, Chapter 5 And Appendices C.1-C.3, D.1-D.2 and E.1-E.2
9	An appropriate assessment of risk for each of the proposed types of maintenance activities and management actions.	Chapter 4
10	Layout and sensitivity maps.	Appendix B
11	Mapped biodiversity features at the site of the proposed maintenance, e.g., Critical Biodiversity Areas, Ecological Support Areas, National Freshwater Ecosystem Priority Areas, etc.	Appendix B
12	Public Participation Process in line with Chapter 6 of the EIA Regulations 2014, as amended.	Appendix J

³ Refer to Appendix F for the DFFE requirements

	AWRMS EMMP
	Proponent  CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD  Making progress possible. Together.

EMERGENCY CONTACT LIST

	Emergency Response	10111
	Police (SAPS) Atlantis	021 571 8515
	Ambulance – Metro, ER24	10177 (Metro) / 084 124 (ER24)
	Wesfleur Government Hospital	021 871 8040
	Mediclinic Milnerton Hospital	086 122 4555
	Poison Information Helpline of the Western Cape (PIHWC) (Snake Bites)	0861 555 777
	Atlantis Fire Department	021 444 4260
	Western Cape Disaster Management	021 937 6301
	Cape Town Municipality Switchboard	0860 103 089
	Cape Town Municipality Emergency	021 487 700
	Department of Environmental Affairs and Development Planning (DEA&DP)	021 483 2707
	Head: Bulk Water Supply & NWP Groundwater Programme Technical Lead: David Allpass	083 252 8237
	Senior superintendent Witsands Water Treatment Works / Manager of the Atlantis Water Scheme Utility Service – Bulk Water: Zwelethu Piliso	082 378 7774

Acronyms

APP	Approved Professional Person
AWRMS	Atlantis Water Resources Management Scheme
BA	Basic Assessment
BMB	Biodiversity Management Branch
BWB	Bulk Water Branch
CBA	Critical Biodiversity Area
CCT	City of Cape Town
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CWCBR	Cape West Coast Biosphere Reserve
DEA&DP	Department of Environmental Affairs and Development Planning
DFFE	Department of Forestry, Fisheries, and the Environment
DWS	Department of Water & Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act (Act No. 73 of 1989)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMMP	Environmental Maintenance Management Plan
ESA	Ecological Support Areas
GA	General Authorisation
GCA	Ganzekraal Conservation Area
GN	Government Notice
HWC	Heritage Western Cape
I&AP	Interested and Affected Party
KNR	Koeberg Nature Reserve
MAP	Mean Annual Precipitation
MSL	Mean Sea Level
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEMPAA	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NEMLAA	National Environmental Management Laws Amendment Act (Act No. 02 of 2022)

NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NID	Notice of Intent to Develop
NWA	National Water Act (Act No. 36 of 1998)
OHSA	Occupational Health and Safety Act (Act No. 85 of 1998)
PES	Present Ecological State
PPP	Public Participation Process
SANS	South African National Standards
SCC	Species of Conservation Concern
SE	Site Engineer
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WANR	Witzands Aquifer Nature Reserve
WDF	Waste Disposal Facility
WMA	Water Management Area
WTW	Water Treatment Works
WULA	Water Use Licence Authorisation
WWTW	Wastewater Treatment Works

Definition of Terms

Activity means an activity identified in any notice published by the Minister or MEC in terms of section 24D(1)(a) of the Act as a listed activity or specified activity. Activity in this document refers to the activities as listed in Listing Notice 1, 2 and 3 of the Environmental Impact Assessment Regulations, 2014 (as amended).

Buffer is a designated area or zone that acts as a barrier to mitigate potential negative impacts.

Bush Encroachment means stands of plants of the kinds specified in column 1 of Table 4 of the Conservation of Agricultural Resources Act (Act No. 43 of 1983) where individual plants are closer to each other than three times the mean crown diameter.

CBA or Critical Biodiversity Areas are terrestrial and aquatic regions identified through a systematic planning process as being essential for meeting regional biodiversity targets and ensuring long-term ecosystem health.

Contractor in the context of this document refers to the external contractor responsible for undertaking maintenance activities included within the scope of this EMMP. The Contractor is responsible for ensuring the day-to-day implementation of the EMMP during the lifecycle of the site activities and is therefore must be well-versed in the contents of this document.

Contractors yard in the context of this document refers to the location and layout of any onsite offices, ablutions, storage containers, fuel storage areas and protection bunds, material lay-down areas, hazardous chemical storage facilities, workshops and plant service and maintenance areas, oil separators and grease traps, first aid facilities, training facilities, central waste storage areas, haul routes and any other facilities associated with the Contractor's yard (as may be applicable).

DEA&DP or Department of Environmental Affairs and Development Planning are the Provincial Authority in the Western Cape responsible for the administration of matters relating to the environment.

Development means the building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or borrow pits, that is necessary for the undertaking of a listed or specified activity, but excludes any modification, alteration or expansion of such a facility, structure or infrastructure, including associated earthworks or borrow pits, and excluding the redevelopment of the same facility in the same location, with the same capacity and footprint.

DFFE or Department of Forestry, Fisheries and the Environment is the National Authority responsible for the administration of matters relating to the environment.

Diverting as defined in the General Authorisation, in terms of section 39 of the National Water Act, 1998 (Act no 36 of 1998) for Water Uses as defined in Section 21(c) and 21(i) (GN. 509 of 26 August 2016), means to, in any manner, cause the instream flow of water to be rerouted temporarily or permanently.

Disciplinary action in the context of this document refers to financial penalties, time penalties, legal action, dismissal and/or any other action taken against the culprit responsible for an incident of non-compliance with the EMMP. The disciplinary action will be determined according to the nature of the non-compliance or crime.

ECO or Environmental Control Officer in the context of this document refers to the party responsible for the environmental compliance and auditing activities required by the EMMP for the lifecycle of the reconstruction and maintenance activities. The ECO is to understand the detailed environmental issues associated with the project and is to be well versed in the contents of the EMMP and its associated reports.

Environmental audit and monitoring refer to the structured observation, measurement and evaluation of environmental data over a period of time to assess the efficiency of environmental mitigation and rehabilitation measures. The auditing and monitoring of the site will commence at intervals as determined in this document and will include a site inspection of the reconstruction and maintenance

activities. A report of the findings at each compliance visit will be compiled and submitted to the Proponent and/or the DFFE as necessary.

Environmental incident refers to an accident or unexpected occurrence related to the maintenance or repair work, including fire, spills, pollution events, explosions, major emissions, flood events, or bank collapse leading to potentially negative environmental impacts.

Environmental management instrument means (i) environmental management framework; (ii) strategic environmental assessment; (iii) spatial tool; (iv) environmental management programme; (v) environmental risk assessment; (vi) environmental feasibility assessment; (vii) norm or standard; (viii) minimum information requirements; or (ix) any other relevant environmental management instrument, as may be developed in time.

EIRF or Environmental Incident Report File refers to a file provided for the recording of all environmental incidents and includes a complaint register for the recording of general public concerns.

EMMP or Environmental Maintenance Management Plan in terms of Regulations pursuant to the National Environmental Management Act, No. 107 of 1998 as approved by the Competent Authority (DFFE).

ESA or Ecological Support Areas terrestrial and aquatic supporting zones, identified through a systematic planning process, which prevent the degradation of Critical Biodiversity Areas and protected areas.

Flood event is the event where land is inundated by the overflowing of water from a river channel and where this event causes significant damage to infrastructure or results in watercourse erosion and/or sediment deposition.

NOTE that flooding can be a natural phenomenon in many river or wetland systems which, due to encroachment and human modification of the form and function of the affected system, may have evolved into a potential hazard to life or property.

Flow-altering as defined in the General Authorisation, in terms of section 39 of the National Water Act, 1998 (Act no 36 of 1998) for Water Uses as defined in Section 21(c) and 21(i) (GN. 509 of 26 August 2016), means to, in any manner, alter the instream flow route, speed or quantity of water temporarily or permanently.

General Authorisation (GA) in terms of Section 39 of the National Water Act, Act (No. 36 of 1998) regulating the use of water in South Africa.

Heritage resource refers to any place or object of heritage significance i.e., of archaeological, palaeontological, cultural, aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Impeding as defined in the General Authorisation, in terms of section 39 of the National Water Act, 1998 (Act no 36 of 1998) for Water Uses as defined in Section 21(c) and 21(i) (GN. 509 of 26 August 2016), means to, in any manner, hinder or obstruct the instream flow of water temporarily or permanently, but excludes the damming of flow so as to cause storage of water.

Indigenous vegetation refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

Invasive vegetation refers to an undesirable alien or indigenous plant growth which shall include, but not be limited to, all declared Category 1 & 2 listed alien invader species as set out in regulations pursuant to the Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA). Other vegetation deemed to be invasive shall be those plant species that show the potential to occupy in number any area within the site area, and which are declared to be undesirable and are generally habitat transformers, germinating rapidly in response to disturbances and capable of out-competing desired indigenous species.

Local Authority means the organisation that is responsible for the public services and facilities in a particular area.

Linear activity means an activity that is arranged in or extending along one or more properties, and which affects the environment or any aspect of the environment along the course of the activity, and includes railways, roads, canals, channels, funiculars, pipelines, conveyor belts, cableways, power lines, fences, runways, aircraft landing strips, firebreaks and telecommunication lines.

Listed Activities are activities identified in terms of section 24 (2) of NEMA (Act No.107 of 1998) as activities that may not commence without an environmental authorisation from the competent authority.

Maintenance in the context of this document means routine or emergency actions performed to keep a structure or system functioning or in service in the same location, capacity and footprint.

Management Authority means the organisation that is responsible for a particular property (e.g., a nature reserve).

Method Statement is a written submission by the Contractor [or Party responsible (e.g. CCT) for undertaking the maintenance activity], to the Engineer (or Party responsible for approving the method statement) in response to the specification or a request by the Engineer, setting out the plant, materials, labour, timeframe and method the Contractor proposes using to carry out an activity, identified by the relevant Specification or the Engineer when requesting the Method Statement, in such detail that the Engineer is enabled to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications. The Method Statement shall cover applicable details with regard to: construction procedures, materials and equipment to be used, transportation of equipment/materials to and from site, movement of equipment/material on site, storage of materials on site, containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur, timing and location of activities, areas of noncompliance with the Specifications, and any other information deemed necessary by the Engineer.

Pollution in the context of this document refers to the contamination of air, water, soil or environment by a foreign substance or matter.

Proponent in the context of this document is the City of Cape Town.

Quaternary Catchment is the basic unit for water resource management in South Africa.

Reconstruction in the context of this document includes, but is not limited to, the reinstatement, repair or replacement of a structure or of infrastructure that was damaged or lost to a flood event and may include alterations to the original design to improve the structure's resilience to future high flow events.

Scarifying refers to the roughening of the surface of soil as a preparation for re-vegetation.

Spoil material is that originating from the reconstruction or maintenance operations, and which cannot be reused.

Stretch a section of watercourse, delineated between two or more mapped coordinates, within which proposed maintenance activities are to take place as guided by a EMMP

Topsoil is defined as a horizon of the soil profile and refers to the upper layer of soil from which plants obtain their nutrients.

Watercourse means:

- (a) a river or spring;
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and

any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998); and a reference to a watercourse includes, where relevant, its bed and banks.

Water Management Areas are defined regions for the management of water resource, established as a unit within the National Water Resource Strategy.

Waste is defined in the National Environmental Management: Waste Act (No. 59 of 2008). There are two main types of waste as follows:

General waste means waste that does not pose an immediate hazard or threat to health or to the environment, and includes-

- (a) domestic waste;
- (b) building and demolition waste;
- (c) business waste; and
- (d) inert waste;

Hazardous waste means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment;

Wastewater in the context of this document refers to water containing pollutants, including chemicals, oils, fuels, soaps, sewerage, or contaminated sediment.

Watercourse/body is defined in the National Water Act (No. 36 of 1998) as:

- (a) a river or spring;
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and

any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Wetland means, land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

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Appendix B – Layout and Sensitivity maps

Appendix C – Freshwater Assessment

Appendix D – Botanical Assessment

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Appendix I – Emergency response plan

Appendix J – PPP

Appendix K – EAP CV

Appendix L – Proponent Declaration

Figures

Figure 1: AWRMS infrastructure locality map

Figure 2: Map of the AWRMS infrastructure in relation to the core (red), buffer (orange) and transition (green) zones of the Cape West Coast Biosphere Reserve

Figure 3: Map showing AWRMS infrastructure in relation to Critical Biodiversity and Ecological Support Areas

Figure 4: Map showing AWRMS infrastructure in relation to protected areas

Figure 5: Schematic of the AWRMS (Source: Integrated Water Use Licence Application Report, City of Cape Town 2021)

Figure 6: Location of AWRMS infrastructure within the G21B Quaternary Catchment.

Figure 7: Zoomed in map of the North Western AWRMS infrastructure and freshwater sensitivities.

Figure 8: Zoomed in map of the Northern AWRMS infrastructure and freshwater sensitivities.

Figure 9: Zoomed in map of the North Eastern AWRMS infrastructure and freshwater sensitivities

Figure 10: Zoomed in map of the eastern section of the AWRMS and freshwater sensitivities.

Figure 11: Zoomed in map of the central AWRMS infrastructure and freshwater sensitivities.

Figure 12: Zoomed in map of the Melkbos pipeline and freshwater sensitivities.

Figure 13: Zoomed in map of the Southern section of the Melkbos pipeline and freshwater sensitivities.

Figure 14: Vegetation Map: The vegetation types within the western side of the study area according to The Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2024 Beta Version) overlaid on a Google Maps TM aerial image.

Figure 15: Zoomed in map of the North-Western AWRMS and vegetation sensitivities.

Figure 16: Zoomed in map of the Northern AWRMS and vegetation sensitivities.

Figure 17: Zoomed in map of the North Eastern AWRMS and vegetation sensitivities.

Figure 18: Zoomed in map of the central AWRMS infrastructure and vegetation sensitivities.

Figure 19: Zoomed in map of the South Eastern AWRMS infrastructure and vegetation sensitivities.

Figure 20: Zoomed in map of the Melkbos Pipeline and vegetation sensitivities.

Figure 21: Zoomed in map of the Southern Melkbos pipeline and vegetation sensitivities.

Figure 22: Palaeontological sensitivity map (Red: Very High sensitivity, green: Moderate sensitivity, blue: Low sensitivity)

Tables

Table 1 DFFE: Minimum Required information to be contained in the EMMP

Table 2 Departmental Sub-Region

Table 3 Details of the Proponent and person responsible for the execution of the EMMP

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Table 5 Details of Municipality

Table 6: Project Team

Table 7: Listed Activities (GN No. R. 327 as amended) considered as part of the proposed reconstruction & maintenance work at the AWRMS.

Table 8: Listed Activities (GN No. R. 325 as amended) considered as part of the proposed reconstruction & maintenance work at the AWRMS.

Table 9: Listed Activities (GN No. R.324 as amended) considered as part of the proposed reconstruction & maintenance work at the Steenbras Catchment and Wellfield.

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1 INTRODUCTION

1.1 Background and Strategic Overview

Due to the severe drought of 2017-2018, a National Disaster was declared under section 41(1) of the Disaster Management Act, 2002 (No. 57 of 2002). In response, the City of Cape Town (CCT) initiated an emergency initiative, called the New Water Programme, to fast-track the implementation of alternative water supply to the CCT. As part of the New Water Programme, the CCT implemented initiatives for water supply which would ultimately contribute to the drought resilience of the CCT in future, including groundwater development, wastewater reuse, desalination, and several water demand management initiatives such as clearing of alien vegetation in stressed catchments.

The upgrading, repair and maintenance of the Atlantis Water Resources Management Scheme (AWRMS) was selected as one of these potential water supply sources, where treated industrial and domestic effluent, and stormwater is collected in basins, from where it seeps into the aquifer. Water is then abstracted from the aquifer (either directly via boreholes or indirectly from the Silwerstroom River which originates at a natural spring) and is pumped to a filtration or water treatment plant before being distributed within the municipal supply.

The declaration of a National Disaster allowed the (then) National Department of Environmental Affairs [DEA, now Department of Forestry, Fisheries, and the Environment (DFFE)], and the Provincial Department of Environmental Affairs and Development Planning (DEA&DP) to issue Section 30A Directives in terms of the National Environmental Management Act (NEMA) (No.107 of 1998), to the CCT. The DEA&DP issued a Section 30A Directive to the CCT in May 2017, and the DFFE issued a Section 30A Directive to the CCT in April 2018, and July 2020, respectively.

This meant that the conventional Environmental Impact Assessment (EIA) process was not required for specific Listed Activities in terms of the NEMA before the implementation of approved water augmentation schemes, provided that the CCT comply with the conditions of the Section 30A Directive.

Nonetheless, compliance to the Directive conditions and best practices have still been required to be followed, such as sensitivity screening of project areas, the development of detailed environmental method statements, on-site Environmental Control Officers, oversight by specialist ecologists, and stakeholder engagement throughout the project lifecycle.

Departmental Sub-Region(s) in which the maintenance is to be undertaken:

Table 2 Departmental Sub-Region

REGION 1 (City of Cape Town Metropolitan and West Coast District) ☒	REGION 2 (Cape Winelands District, Overberg District) ☐	REGION 3 (Eden & Central Karoo Districts) ☐
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Details of the person / proponent who will undertake the maintenance activities:

Table 3 Details of the Proponent and person responsible for the execution of the EMMP

Proponent	
Contact person:	Zwelethu Piliso Senior superintendent Witsands Water Treatment Works / Manager of the Atlantis Water Scheme Utility Service – Bulk Water
Telephone number:	T: 021 444 9180 M: 082 378 7774
Email address:	Zwelethu.Piliso@capetown.gov.za
Physical address	Witzands Water Treatment Works, Dassenberg Drive, Atlantis
Postal address:	Witzands Water Treatment Works, Dassenberg Drive, Atlantis, 8000

Details of the Environmental Assessment Practitioner (EAP) responsible for the preparation of the EMMP:

Table 4 Details of the EAP

Environmental Assessment Practitioner (EAP)	
Contact person:	Corlie Steyn
Telephone number:	044 805 5421
Facsimile number:	044 805 5454
Email address:	Corlie.Steyn@zutari.com
Postal address:	P.O. Box 509, George, 6530
EAP Qualifications	MPhil Environmental Management
EAP registrations/Associations	EAPASA Reg No 2019/999

Details of the EAP's expertise to carry out EMMPs

Corlie is a professional registered (EAPASA) senior environmental practitioner specialising in environmental consulting for various disciplines. She has most recently been involved in waste water treatment works, renewable, civil, roads - and gas power related projects.

Details of the EAP's expertise to carry out EMMPs

Corlie has extensive experience in environmental management and research projects related to climate change. She also has experience in the evaluation and review of environmental impact assessments (EIAs); advising on law enforcement and environmental matters; managing public participation processes (PPPs), including in-depth interviews with stakeholders; chairing workshops and presenting final reports to government departments and civil society stakeholders. Corlie is a registered member of the International Association for Impact Assessment South Africa (IAIASa). Corlie was a part-time lecturer at the Nelson Mandela University's (NMU's) Department of Nature Conservation for 8 years. She holds an MPhil degree in Environmental Management from the University of Stellenbosch, South Africa. She also holds an Honours Degree in Geography, a BA Degree and a Higher Education Diploma, all obtained from the University of Pretoria in South Africa.

Name of landowner(s) on whose behalf the plan has been developed:

Please refer to Annexure A for the list of landowners.

Municipality:

Table 5 Details of Municipality

Municipality		
Municipality for proposed project:	City of Cape Town	
Farm name(s), erf(s) and portion number(s) etc:	Farm Witzand; Farm 2 Portion 1 Remaining Extent (C0160000000000200001) Farm Witzand; Farm 2 Portion 2 (C01600000000000200002) Farm Witzand; Farm 2 Portion 3 (C01600000000000200003) Farm 1183 Remaining Extent (C01600000000118300000) Farm 982 Portion 2 (C04600000000098200002) Farm Kleine Springfontyn; Farm 33 Portion 27 (C01600000000003300027) Farm Kleine Springfontyn; Farm 33 Portion 28 (C01600000000003300028) Farm Kleine Springfontyn; Farm 33 Portion 29 (C01600000000003300029) Farm Kleine Springfontyn; Farm 33 Portion 30 (C01600000000003300030) Farm Melk Post; Farm 3 Portion 5 (C0160000000000300005) Farm Melk Post; Farm 3 Portion 6 Remaining Extent (C0160000000000300006) Farm Brakkefontein; Farm 32 Portion 5 (C01600000000003200005) Farm Brakkefontein; Farm 32 Portion 7 (C01600000000003200007) Farm 55 (C01600870000005500000)	
Magisterial District or Town:	Western Cape: City of Cape Town	
Name(s) of watercourse(s) in question:	Silwerstroom Stream and spring, Donkergat River, unnamed tributaries of the Modder River, Sout River & unnamed tributaries of the Sout River.	

1.2 Details of the Project Team

Zutari has a team of experienced specialists and multi-disciplinary practitioners to execute this project in a professional manner. Please refer to Table 6 for the project team. A full CV of the EAP is available in Annexure K. Specialist CVs are included in the respective specialist reports in Appendices C and D respectively.

Table 6: Project Team

Role	Consultant	Company
Project Management Team		
Senior EAP	Corlie Steyn	Zutari
Junior Consultant	Colin Tucker	Zutari
PPP	Marianna Taljaard	Zutari
Sub-consulting Specialists		
Freshwater Ecological Assessment	Philip Frenzel	Freshwater Consulting Group
Botanical Assessment	Paul Emms	Capensis

1.3 Independence

The amended 2014 EIA Regulations under NEMA, provide general requirements for EAPs and specialists to reduce the potential for bias in the environmental process. The first requirement is that the EAP should be independent (Regulation 13(1)(a) of GN R982, as amended). Neither Zutari nor any of its sub-consultants are subsidiaries of DFFE nor is DFFE a subsidiary of Zutari. The EAP and Specialists have provided declarations of independence, and these are appended to this report in Appendices C, D and K.

1.4 Assumptions, Limitations and Gaps in Knowledge

In undertaking the assessments and compiling the EMMP, the following has been assumed:

- o The information provided by the Applicant is accurate and no information that could alter the compilation of the EMMP has been withheld.
- o All information provided by the appointed specialists is complete, accurate and true.
- o The scope of the assessments undertaken is limited to the proposed environmental impacts associated with the proposed maintenance of the AWRMS infrastructure in terms of cumulative considerations.
- o The EMMP was compiled based on the Best Practice Guidelines which were available at the time of writing this report.
- o Any additional and requisite permits of authorisations required for the maintenance in terms of other legislation will be dealt with by the Applicant outside this process.

Any gaps that have been encountered by the specialists have been identified in their respective assessments (Appendices C and D).

The DFFE and other authorities were requested to provide comments on the EMMP and the associated reports. The assumptions, limitations and gaps in knowledge did not affect the EAP's assessment or findings associated with the proposed maintenance.

1.5 Objective of the EMMP

The purpose of the EMMP is to maintain both man-made and ecological infrastructure in a manner that improves the current state of, and/or reduces the negative impacts on the affected watercourses and indigenous vegetation to ensure that ecosystem services are preserved/improved and to prevent further deterioration of the watercourses, ecosystems, and natural environment.

The objective of this EMMP is to formulate measures, which will:

1. Mitigate adverse impacts on various environmental components;
2. Protect environmental resources where possible and prevent further deterioration to the condition of affected watercourses;
3. Enhance the value of environmental components where possible;
4. Avoid and reduce unnecessary maintenance;
5. Enhance environmental compliance and mitigate the risk of non-compliance and resultant enforcement actions by the Competent Authorities.
6. Meet the requirements of both the DFFE as the competent authority (Appendix F) in terms of the NEMA EIA Regulations, 2014 (as amended) , as well as the requirements of the delegated water authority, regarding general authorisation considerations for sections 21(c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998), to ensure alignment between the two authorities when defining or adopting the EMMP.
7. To facilitate efficient maintenance of existing infrastructure.

1.6 Project Description and Location

Construction of the AWRMS was completed by 1979. In short, this scheme consists of basins which allow for the infiltration of storm water, and treated wastewater to recharge the sandy aquifer, which acts as an underground water reservoir. A portion of the water is diverted towards coastal recharge basins, which maintain a high-water table along the coast to prevent the intrusion of sea water into the aquifer. Water from the aquifer is abstracted by boreholes in the Witzand and Silwerstroom wellfields and is pumped to a water treatment plant before being distributed into the municipal supply system. The basins, wellfields and water treatment plants are currently in the process of being repaired and upgraded in order to further augment the water supply within the region.

The majority of the basins, and the treatment works are located in Atlantis (a town in the northern portion of the City of Cape Town municipality), the infiltration basins are located partially within the Witzands Aquifer Nature Reserve (WANR), and the coastal recharge basins are located in Koeberg Nature Reserve (KNR). The wellfields are located in KNR, WANR and the Ganzekraal Conservation Area (GCA). The Silwerstroom weir and filtration works are located to the east of Silwerstroomstrand (see Figure 1 for a locality map).

Appendix A.7 provides the detail for the identification of the affected infrastructure where the repair and maintenance works will take place.

The infrastructure includes *inter alia*:

- o Roads;
- o Bridges;

- o Culverts
- o Infiltration and stormwater basins (with overflow switch boxes, litter traps, oil traps, evaporation ponds, etc.)
- o Coastal recharge basins;
- o Water treatment plants
- o Reservoirs
- o Weirs
- o Below ground pipelines;
- o Above ground pipelines;
- o Production borehole sites and associated infrastructure (e.g., pumpstations);
- o Below ground powerlines and communication cables;
- o Above ground powerlines and communication cables;
- o Monitoring borehole sites;
- o Stockpile areas

1.6.1 Equipment

Equipment to be used for maintenance and repair may comprise *inter alia* of digger loaders, excavators, rollers / compactors, tip trucks, compressors, jackhammers, welding equipment, crane trucks for the movement of large infrastructure and chainsaws.

1.6.2 Method for Planned Maintenance Activities:

1. Repair of damaged water crossing infrastructure:

This would include the replacement of broken culverts, redirecting of culverts which are located against the natural flow of a river, dredging inside the watercourse to obtain access to infrastructure, removal of flood debris and silt and the infilling of material for stabilisation and support of new infrastructure.

2. Replacement of damaged road and pipeline infrastructure after large storm events:

In most instances after large storm events there is some degree of damage, including erosion of banks, gravel roads and bridge approaches. Some flood debris could also cause damage to the infrastructure itself which would need to be fixed or replaced if damaged extensively. This could entail dredging, excavating and infilling in a stream.

3. Repair of pipeline and cable infrastructure:

Over time some damage could occur to the installed pipeline, electrical and communication infrastructure, which would result in machinery needing to access the pipe or cables over / underneath the stream and would entail dredging, excavating and potentially infilling inside a watercourse. More than 300 square metres of indigenous vegetation could be cleared for maintenance of below ground linear infrastructure (e.g. pipelines, powerlines, telemetry etc.) where the linear infrastructure would need to be excavated and repaired.

4. Clearing of silt or flood debris from infrastructure (e.g., culverts, weir and basins) and watercourses:

Over time, material such as silt, dead vegetation and litter will accumulate along, under, downstream of, behind and within infrastructure, and in rivers and wetlands. These need to be cleared regularly to ensure proper functioning of the infrastructure and ecosystems and prevent flooding and associated

damage within these areas. The clearing would entail the dredging or excavating of debris, silt and other flooded material from the infrastructure.

5. Clearing of alien invasive vegetation from watercourses, weirs and basins:

Large alien invasives will be cleared using chainsaws. Smaller plants will be removed by hand using hand tools to remove the roots from the beds and banks of watercourses. Excavators may be needed to clear alien invasives in areas where access is limited, such as within saturated basins and abstraction ponds above weirs. All plant material will be removed and disposed of at a licenced WDF, with proof thereof retained.

6. Clearing of indigenous vegetation around the borehole sites in case of borehole maintenance or drilling activities:

More than 300 square metres of indigenous vegetation could be cleared during redrilling or maintenance activities (e.g., borehole cleaning) needed at any of the borehole sites for the establishment of drill rigs and/or other equipment.

7. Replacement of eroded stream crossing approaches:

Over time some of the gravel road approaches alongside the stream crossings could erode and cause the need for replacement or installation of erosion control measures. This would entail the infilling of material within close proximity of watercourses or within wetlands.

8. Replacement and maintenance of erosion control measures:

Where erosion control measures are already installed, maintenance would have to be done to ensure these remain in good working order or that areas that become prone to erosion is secured to protect infrastructure and prevent downstream impacts to the aquatic ecosystems. This would entail the potential excavation and infilling of material within watercourses or wetlands and activities such as gabion basket installations.

9. Maintenance of firebreaks and fencing:

Where firebreaks align with pipeline infrastructure regular brush-cutting is required. Fencing may also need to be either repaired or replaced around basins, requiring clearing of indigenous and/or alien vegetation in some instances.

10. Pumping of production boreholes to waste:

Periodically, it may be required to pump production boreholes to waste after a long stoppage in production pumping from boreholes due to maintenance or after borehole rehabilitation.

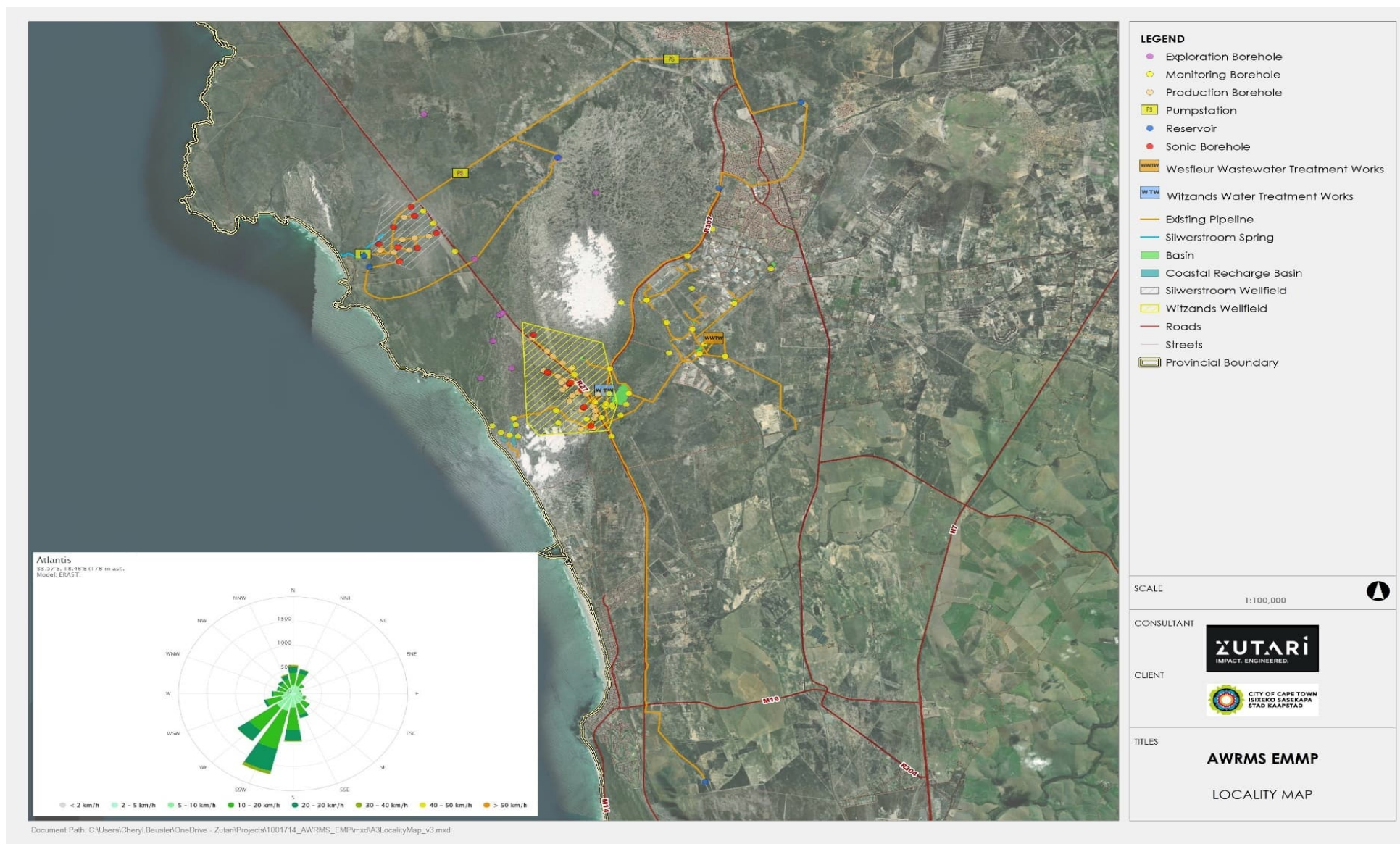


Figure 1: AWRMS infrastructure locality map

1001714-0000-PLN-NM-00001, Revision 0.1, Date 2025/12/05

2 RELEVANT LEGISLATION AND POLICIES

This EMMP is relevant to the repair and maintenance of existing access roads, bridges, culverts, basins, pipelines, pump houses, reservoirs, weirs and borehole infrastructure located within sensitive terrestrial ecosystems, watercourses, and wetlands for the AWRMS, located in the town of Atlantis, in the Western Cape. This EMMP is a working document for, amongst others, the following activities:

- The repair of existing structures, **where work does not require Environmental Authorisation (EA)** in terms of the National Environmental Management Act, No. 107 of 1998 (NEMA) **if undertaken in accordance with an approved EMMP.**
- The routine and emergency *maintenance* activities associated with improving roads, bridges, boreholes, culverts, basins and pipe crossings **where work does not require Environmental Authorisation (EA)** in terms of the NEMA **if undertaken in accordance with an approved EMMP.**

A large portion of the Atlantis Water Resources Management Scheme (AWRMS) infrastructure was developed in the 1970s. During this time there was no environmental legislation which required environmental authorization as economic development was prioritized over the environment.

During 1989 the Environmental Conservation Act (ECA). No. 73 was promulgated, and the aim of this act was providing for the effective protection and controlled utilisation of the environment. At the time maintenance activities were often developed in accordance with the principles that were outlined in the ECA.

Currently, refurbishments of various portions of the AWRMS infrastructure are underway, including wellfields, basins, pipelines and water treatment facilities. This work has triggered (or may trigger) various NEMA Listed Activities, including those regarding:

- o The length, diameter and throughput capacity of pipelines;
- o The clearance of indigenous vegetation;
- o The infilling, depositing, dredging or excavation of more than 10m³ of material into / out of watercourses;
- o The throughput capacity of infrastructure for the treatment of effluent; and
- o The development and widening of roads.

This refurbishment work is being completed under the S30A Directive, as described in Section 1.1.

2.1 National Environmental Management Act (Act No. 107 of 1998)

2.1.1 Listed Activities in terms of NEMA

The NEMA, as amended, provides the framework for environmental decision-making in the country, with the EIA Regulations (GN No. R982 in the Government Gazette of 8 December 2014, as amended) serving as the instrument through which development decisions are made.

South Africa has rigorous and comprehensive environmental legislation aimed at preventing degradation of the environment. Section 28(1) of NEMA places a “*duty of care and remediation of environmental damage*” on every person who causes, has caused, or may cause, significant environmental degradation. This is a far-reaching obligation, and accordingly, those parties responsible for the degradation of the environment have a legal duty to avoid, minimise or mitigate such impacts.

This has resulted in a set of Listed Activities that can be triggered by developments taking place in sensitive environments, e.g., watercourses. If a development triggers a Listed Activity, it is required to undergo an EIA or Basic Assessment (BA) process in terms of the EIA Regulations (GN R982, as amended).

Due to the nature and location of the proposed works, the EIA Regulations (Listing Notice 1, 2 and 3 of December 2014, as amended) pursuant to the NEMA, as amended, were consulted. Table 7 below provides an extract of the Listing Notices and Listed Activities that were considered in the context of the AWRMS, as proposed by the Proponent.

Table 7: Listed Activities (GN No. R. 327 as amended) considered as part of the proposed reconstruction & maintenance work at the AWRMS.

Activity No(s):	Basic Assessment Listed Activity(ies) as set out in the EIA Regulations Listing Notice 1 of 2014 (GN No. R. 327 as amended)	Comment Regarding Applicability
18	The planting of vegetation or placing of any material on dunes or exposed sand surfaces of more than 10 square metres, within the littoral active zone, for the purpose of preventing the free movement of sand, erosion or accretion, excluding where — the planting of vegetation or placement of material relates to restoration and maintenance of indigenous coastal vegetation undertaken in accordance with a maintenance management plan; or such planting of vegetation or placing of material will occur behind a development setback.	The planting of vegetation or placing of any material on dunes or exposed sand surfaces of more than 10m² within the littoral active zone requires prior Environmental Authorisation unless the activity/ies are for maintenance of indigenous coastal vegetation in accordance with an EMMP. Approval of this EMMP will allow the activities to be carried out without undertaking a Basic Assessment.
19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse; But excluding where such infilling, depositing, dredging, excavation, removal or moving — (b) is for maintenance purposes undertaken in accordance with a maintenance management plan	Movement of any material exceeding 10 m³ within a watercourse requires prior Environmental Authorisation unless the activity/ies are for maintenance purposes in accordance with an EMMP. Approval of this EMMP will allow the activities to be carried out without undertaking a Basic Assessment.
27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for — (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The clearance of more than 1ha of indigenous vegetation requires prior Environmental Authorisation unless the activity/ies are for maintenance purposes in accordance with an EMMP. Approval of this EMMP will allow the activities to be carried out without undertaking a Basic Assessment.

Table 8: Listed Activities (GN No. R. 325 as amended) considered as part of the proposed reconstruction & maintenance work at the AWRMS.

Activity No(s):	Basic Assessment Listed Activity(ies) as set out in the EIA Regulations Listing Notice 2 of 2014 (GN No. R. 325 as amended)	Comment Regarding Applicability
15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The clearance of more than 20ha of indigenous vegetation requires prior Environmental Authorisation unless the activity/ies are for maintenance purposes in accordance with an EMMP. Approval of this EMMP will allow the activities to be carried out without undertaking a scoping and Environmental Impact Assessment.

Table 9: Listed Activities (GN No. R.324 as amended) considered as part of the proposed reconstruction & maintenance work at the Steenbras Catchment and Wellfield.

Activity No(s):	Basic Assessment Listed Activity(ies) as set out in the EIA Regulations Listing Notice 3 of 2014 (GN No. R. 324 as amended)	Comment Regarding Applicability
12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. i). Western Cape i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; iii. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas; iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or v. On land designated for protection or conservation purposes in an Environmental Management Framework adopted in the prescribed manner, or a Spatial Development Framework adopted by the MEC or Minister.	Clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation requires Environmental Authorisation unless the activity/ies are for maintenance purposes in accordance with an EMMP. Approval of this EMMP will allow the activities to be carried out without undertaking a Basic Assessment.

2.2 DFFE Consultation

A Pre-Application Meeting request was submitted to DFFE on 13 September 2024. A response was received from DFFE on 16 September 2024, wherein a case officer and reference number was provided, and it was indicated that a Pre-Application Meeting was not required (Refer Appendix F).

An Application for the Adoption of an EMMP, was submitted to DFFE on XX 2025.

2.3 Public Participation

- o As required by DFFE, as part of the minimum requirements for an EMMP a Public Participation Process (PPP) must be undertaken in line with Chapter 6 of the EIA Regulations, 2014 as amended. This process shall include

- o A 30-day comments and response period;
- o An Interested and Affected Parties (I&APs) database will be compiled and will include affected landowners, relevant local, provincial and national governmental departments, and other stakeholders registering as I&APs during the 30-day period;
- o The Draft EMMP will be available on the Zutari website for the duration of the PPP comment period;
- o An Advert will be placed in a local newspaper,; and
- o Site Notices will be placed at relevant locations within the areas where AWRMS infrastructure is located.

All comments received during this period will be recorded and incorporated into the Draft EMMP which will be converted into a Final EMMP. The Final EMMP will be submitted to the DFFE for decision making. Refer Appendix J

2.4 Other Applicable Environmental Legislation

2.4.1 The National Water Act (Act No. 36 of 1998) (NWA)

The Department of Water & Sanitation (DWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, and aquifers. The National Water Act (No. 36 of 1998) (NWA) aims to protect water resources, through:

- o The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- o The prevention of the degradation of the water resource;
- o The rehabilitation of the water resource;

No activity may take place within a watercourse⁴ unless it is authorised by the DWS. According to Section 21 (c) and (i) of the NWA, a WUL is required for any activities that impede or divert the flow of water in a watercourse or alter the bed, banks, course or characteristics of a watercourse. The regulated area of a watercourse for section 21(c) or (i) of the NWA water uses means:

- a. *The outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;*
- b. *In the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or*
- c. *A 500 m radius from the delineated boundary (extent) of any wetland or pan.*

Any water use activities that do occur within the regulated area of a watercourse must therefore be assessed using the DWS Risk Assessment Matrix (GN 509) to determine whether activities may be generally authorised (Low Risk according to the Risk Assessment Matrix) or require a WULA (Medium or High Risk according to the Risk Assessment Matrix).

⁴ A watercourse means: a river or spring; a natural channel in which water flows regularly or intermittently; a wetland, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

2.4.1.1 AWRMS WUL Status Quo

- A WUL for the refurbishment of basin 6 was issued on 24 November 2022 (Ref: 01/G21B/IJ/12429)
- A WUL for the recharge of the Atlantis Aquifer was issued on 15 December 2014 (Ref: 19/G21B/E2789).
- An iWULA for the following NWA Section 21 water uses was issued on 16 October 2024:
 - o Abstraction from the Atlantis Aquifer and Silwerstroom Weir (Section 21(a))
 - o Recharging the Atlantis Aquifer with water containing treated effluent (Section 21 (e)).
 - o The operation and maintenance of the Silwerstroom Weir involves impeding the flow of water in the Silwerstroom River (Section 21 (c)) and altering the bed, banks, course or characteristics of the Silwerstroom River (Section 21 (i)).
 - o The diversion of treated domestic effluent to the Donkergat River (Section 21 (f) and (i)).

Refer to Appendix G for the approved WULA.

2.4.2 The National Heritage Resources Act (Act No. 25 of 1999) (NHRA)

Section 34 of the National Heritage Act (No. 25 of 1999) (NHRA) protects buildings and structures older than 60 years.

Section 38 of the NHRA identified activities that would require a heritage authorisation.

- (a) *the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;*
- (b) *the construction of a bridge or similar structure exceeding 50 m in length;*
- (c) *the re-zoning of a site exceeding 10 000 m² in extent; or*
- (d) *any development or other activity which will change the character of a site—*
 - (i) *exceeding 5 000 m² in extent; or*
 - (ii) *involving three or more existing erven or subdivisions thereof; or*
 - (iii) *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
 - (iv) *(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*
- (e) *any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,*

Where a heritage authorisation is required, a heritage specialist would need to submit a Notice of Intent to Develop (NID) to Heritage Western Cape (HWC), who would determine whether a Heritage Impact Assessment must be undertaken.

- A NID was sent to HWC for the construction of raw water tanks at the Witzands Water Treatment Works (WTW). A Record of Decision was received from HWC on 1 October 2019, stating that no further action was required.
- A NID was sent to HWC for the refurbishment of basins 5, 6, 7, 9, 10, 11 and 12. A Record of Decision was received from HWC on 8 October 2019, stating that no further action was required.
- A NID was sent to HWC for the construction of a haul road between the basin 6 works area and Appollo Bricks. A Record of Decision was received from HWC on 13 February 2024, stating that no further action was required.

- A NID was sent to the HWC for all AWRMS infrastructure as part of the EMMP process. A Record of Decision was received from HWC on 10 June 2025 stating that no further action was required.
- A NID was sent to the HWC for the installation of a fibre network in the Silwerstroom Wellfield. A Record of Decision was received from HWC on 1 July 2025 stating that no further action was required.

Refer to Appendix E for the Record of Decision from HWC.

2.4.3 The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA)

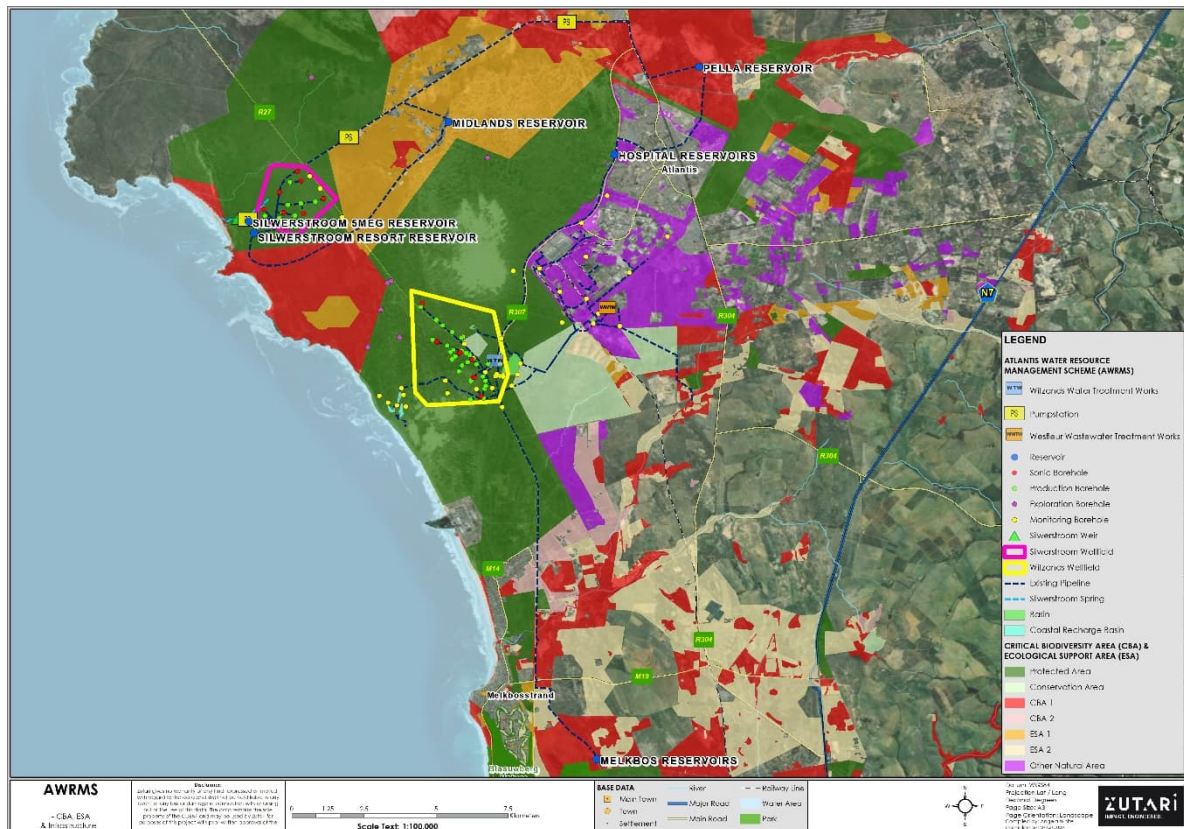
The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment.

The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment, 2004. NEMBA also deals with endangered, threatened and otherwise controlled species. The Act provides for listing of species as threatened or protected, under one of the following categories:

- o Critically Endangered: any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- o Endangered: any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- o Vulnerable: any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- o Protected species: any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Certain activities, known as Restricted Activities, are regulated by a set of permit regulations published under the Act. These activities may not proceed without environmental authorization.

Of the four vegetation types within which the AWRMS infrastructure is located, two are listed as Endangered (Cape Flats Dune Strandveld and Atlantis Sand Fynbos) whereas the remaining two are listed as Critically Endangered (Swartland Shale Renosterveld and Cape Flats Sand Fynbos).



2.4.4 National Environmental Management: Protected Areas Act (Act No 57 of 2003) (NEMPAA)

This act provides for the declaration and management of specifically identified areas in South Africa. The Act must be read in conjunction with the NEMBA. The AWRMS falls with the Cape West Coast Biosphere Reserve (CWCBR), with sections falling with the KNR, WANR and GCA protected areas (Figure 4). The CCT is the agency responsible for managing the AWRMS infrastructure, as well as the WANR, while the GCA is managed by Cape Nature. The KNR is managed by Eskom.

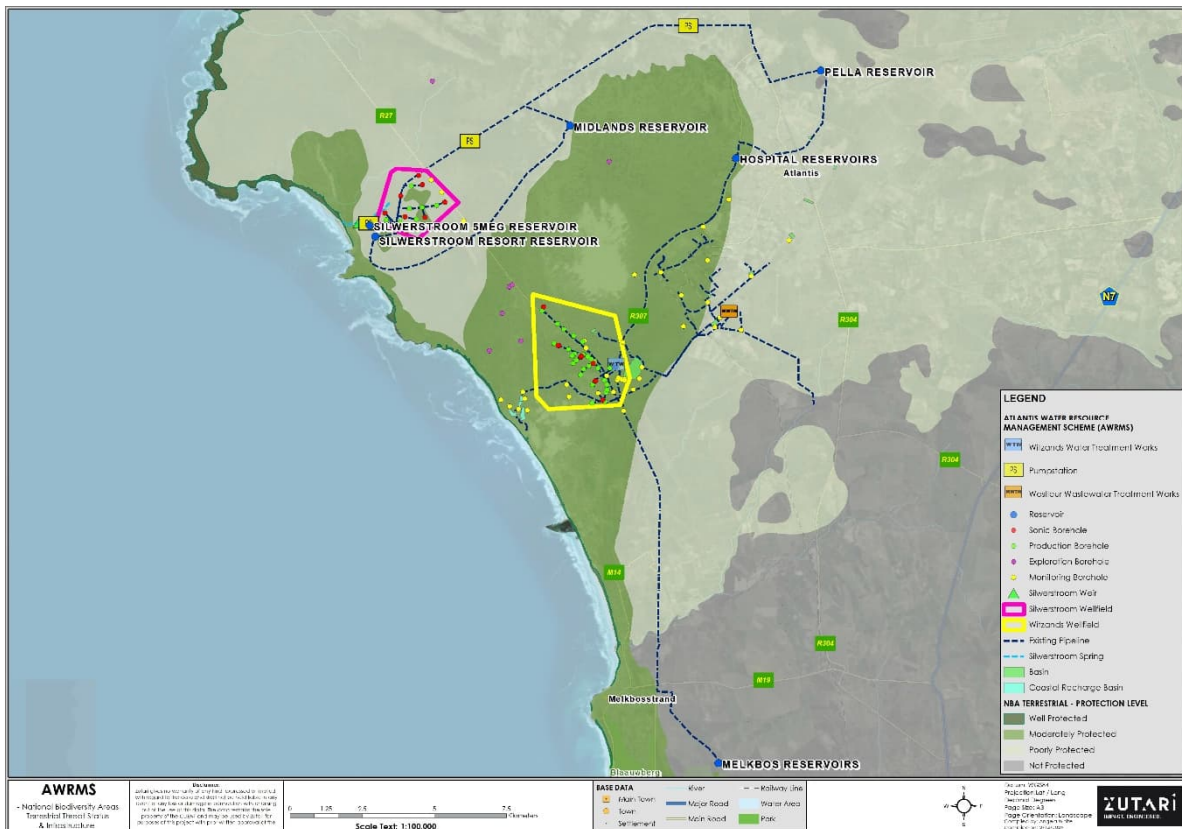


Figure 4: Map showing AWRMS infrastructure in relation to protected areas

3 SITE CONTEXT

3.1 Site and Existing Infrastructure

3.1.1 Overview

The AWRMS is situated near the northern boundary of the CCT, consisting of infrastructure at the coast, and inland within various nature reserves (see section 2.4.4), and rural and urban areas within and surrounding the town of Atlantis. The infrastructure sites are located within transition, buffer and core zones of the CWCBR. The CWCBR was registered with the United Nations Educational, Scientific and Cultural Organisation (UNESCO), giving the area international conservation significance.

Construction of the AWRMS began in 1973 and was completed by 1979. Recharge of the aquifer commenced in 1979 where treated domestic effluent, all of the domestic / residential stormwater, and most of the industrial stormwater is used for recharging the aquifer in two infiltration basins (Basin 7 and 12). The treated domestic effluent comes from the Wesfleur Wastewater Treatment Works (WWTW), the domestic stormwater from the residential stormwater basins (Basins 1-4), and the industrial stormwater from Basins 5 and 9. The three sources of water are then mixed in the conditioning basin (Basin 6) before transferring to the infiltration basins.

Industrial effluent and storm water from the noxious trade area is diverted to the coastal recharge basins located within the KNR in order to prevent seawater intrusion into the main aquifer from abstraction activities. The industrial effluent comes from Wesfleur WWTW, and the industrial stormwater from the noxious trade area comes from Basin 10.

Groundwater is abstracted from the aquifer from two wellfields, namely the Witzands wellfield and the Silwerstroom wellfield. The Witzands wellfield is located within KNR and WANR and abstracted water is pumped to the Witzands WTW for treatment and thereafter to the Hospital and Pella Reservoirs for distribution to the town of Atlantis. The Witzands WTW also receives water from the Voëlvlei Dam via Melkbos reservoirs. The Silwerstroom wellfield is located within the GCA and abstracted groundwater is filtered and then pumped to the Pella Reservoir for distribution to the town of Atlantis. The Silwerstroom spring and watercourse, also located in the GCA, are also intercepted by a weir where water is abstracted and pumped to the Pella Reservoir.

Brine from the Witzands WTW, which is a product from the treatment of the groundwater, is also sent to the coastal recharge basins via underground pipelines. There is also an alternative discharge route from Basin 6 to the Donkerkat River to allow for emergency repairs and maintenance, and in case the basins are too full to receive additional water.

The coastal recharge basins and numerous production and monitoring boreholes and pipelines are located within the KNR. The 3000ha KNR, which is owned and managed by Eskom, was proclaimed in 1991 in terms of Ordinance 19 of 1974.

Infrastructure located within the WANR includes production and monitoring boreholes, pipelines, the Witzand WTW and the infiltration basins. The reserve is managed by the CCT and was proclaimed in 2018 (Provincial Gazette 7859, Notice 01 of 12 January 2018). Infrastructure located within the GCA includes production and monitoring boreholes, pipelines, the Silwerstroom weir, and Silwerstroom pump station and filtration building. The GCA is managed by Cape Nature.

Due to the severe drought in 2017-2018, the CCT initiated the New Water Programme, which included the upgrading of the AWRMS under a Section 30A directive that was issued to the CCT.

To date the AWRMS consists of production and monitoring boreholes (with their associated pump stations and chambers) within the above-mentioned wellfields and across the broader scheme, a primary and secondary coastal recharge basin, 2 infiltration basins, 10 stormwater basins, 5 sets of reservoirs and a network of above and below ground pipelines.

3.1.2 Need and desirability of the EMMP

The purpose of the EMMP is to ensure that the environmental impacts of the proposed maintenance activities are managed, mitigated, and kept within permissible limits.

This EMMP has been compiled with the multi-disciplinary inputs from various specialists: (i) Freshwater (Appendix C) (ii) Biodiversity (Appendix D) and (iii) Heritage (Appendix E).

The EMMP document stands as an internal record to guide all future operational maintenance activities pertinent to specific identified locations and infrastructure. The EMMP should be updated / amended as appropriate when new interventions are required. An internal review of the EMMP must take place at least once per 5 years⁵ to ensure that the most up to date and environmentally sustainable best practice methods are being employed to achieve the required intervention objectives.

This EMMP is considered a working document which, through monitoring and recommendations made by an Environmental Control Officer (ECO) and, on occasion, the relevant specialist ecologists, must be updated/changed where relevant.

⁵ Environmental implementation plans and **management plans** (1) Every national department listed in Schedule 1 as exercising functions which may affect the environment and every provincial department responsible for environmental affairs must prepare an environmental implementation plan within five years of the coming into operation of this Act, and at intervals of not more than five years thereafter (NEMLAA: National Environmental Management Laws Amendment Act, 2022, proclaimed).

3.1.3 Stormwater, Infiltration and Coastal Recharge Basins

The explanation below along with the accompanying diagram (Figure 5) provides an overview of the AWRMS basin infrastructure, including the function of each basin and the connections between the basins.

Basins 1 – 4, 8 and 11

These basins were designed as detention basins, remaining dry through most of the year and functioning as peak flow reduction measures for stormwater runoff.

- Basins 1 – 4 receive domestic stormwater runoff (draining sequentially from basin 1 to basin 4). Water from basin 4 is piped to basin 6.
- Basin 11 receives stormwater runoff from three inflows and the outflow is discharged to open land where it infiltrates and evaporates.

Basins 5, 6, 9 and 10

These basins were designed to act as wet basins wherein reed beds could establish to polish the water quality prior to infiltration to the aquifer via basins 7 and 12.

- Basin 5 receives stormwater runoff from Atlantis' light industrial area, which is then piped to basin 6.
- Basin 6 is a retention pond with a constructed reed bed, receiving stormwater water from basin 5 and basin 9, as well as treated domestic effluent from the Wesfleur WWTW. The treated effluent and stormwater are blended within basin 6 before being discharged to the infiltration basins 7 and 12.
- Basin 9 receives water from Atlantis' heavy industrial area and possibly sewer spills from the pump station overflow sump adjacent to the basin, with this water being discharged to basin 6.
- Basin 10 receives stormwater runoff from the noxious industrial trade area, and likely sewer spills from a sewer pump station. Outflow from basin 10 drains to the coastal recharge basin.

Basins 7 and 12

These are infiltration basins used for managed aquifer recharge up-gradient of the Witzand Wellfield.

- Basin 7 is the main infiltration basin and receives low flows from basin 6. It is mostly wet due to the volume of water entering the basin, the shallow groundwater table, and a relatively low infiltration rate.
- Basin 12 is mostly dry as it mainly receives peak stormwater overflows, which are directed to it via a splitting weir before basin 7. It has a deeper water table and higher infiltration rate in comparison with basin 7.

Coastal Recharge Basins

These basins are used to recharge the aquifer in the vicinity of the coast as a mitigation measure against potential seawater intrusion. Treated industrial effluent from Wesfleur WWTW, flow from basin 10, and softening plant wastewater and pipeline flush water from the Witzand WTW all contribute to these basins (Umvoto Africa, 2019).

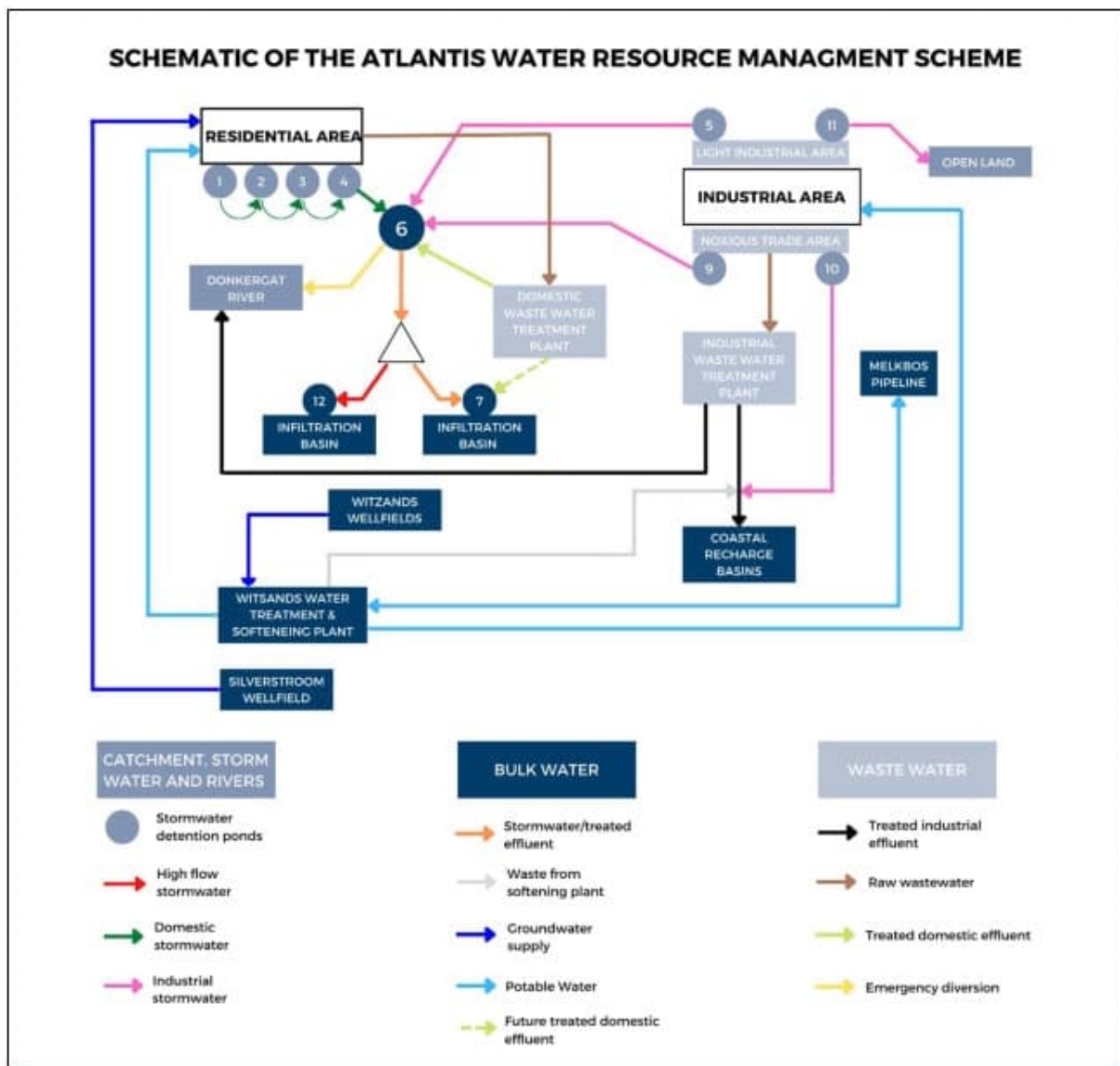


Figure 5: Schematic of the AWRMS (Source: Integrated Water Use Licence Application Report, City of Cape Town 2021)

3.1.4 Basin Refurbishment Works

Over time, due to aged infrastructure and inconsistent maintenance, the performance and operation of the basins have become suboptimal, increasing the contamination risk to the aquifer. A refurbishment programme, which commenced under the Section 30A directive, was in place at the time of submitting this EMMP. The primary objective of this programme is to improve the quality of the water that is being discharged to infiltration basins 7 and 12 as well as the coastal recharge basins. The works taking place are as follows:

- The installation of litter traps to capture litter during stormwater flows and allow for removal during maintenance.
- The installation of silt traps to capture silt during high flows and allow for removal during maintenance.
- The installation of oil traps to prevent the migration of oil beyond the contamination basin.
- The reconstruction/upgrading and expansion/deepening of basins to capture contaminants and promote diffuse flow into conditioning ponds/reed beds.

- Upgrade of bulk stormwater pipelines and valves where necessary to facilitate effective transfer and diversion of specific water types (Umvoto Africa, 2019).

3.1.5 Wellfield upgrade and refurbishment works

A number of additional monitoring and production boreholes have been drilled in the Witzands and Silwerstroom wellfields. Maintenance and redrilling of existing boreholes is ongoing. New boreholes are being equipped and linked to the existing collector pipelines.

3.2 Freshwater

3.2.1 Background

The main town of Atlantis within which a portion of the AWRMS infrastructure is situated, comprises residential and industrial land uses. Historic imagery was consulted to determine whether any major changes in land uses (and subsequent ecological condition) were noted within the broader AWRMS study area. Large parts of the study have remained largely natural, however, along infrastructure routes (pipelines and roads) disturbances can clearly be noted. The areas around the towns of Atlantis, Mamre and Melkbos have experienced urban encroachment into areas that were largely natural, as visible in the earliest available imagery. Agricultural fields were already visible in 1938 along portions of the southern sections of the AWRMS infrastructure.

An extensive water quality dataset containing data from 2017 to 2024 was received from Umvoto (Pty) Ltd, who have been involved in water quality monitoring of the AWRMS for several years. The dataset details the extensive list of parameters that are routinely monitored across a wide borehole (groundwater) monitoring network as well as at strategic surface water locations associated with the pipelines and discharge locations. The dataset includes numerous parameters relating to macro chemistry (e.g. pH, electrical conductivity, various nutrients, etc.), inorganics, total and dissolved metals (e.g. aluminium, arsenic, copper, cyanide, etc.), microbes (e.g. *Escherichia coli*, total coliform bacteria, microcystins etc.), pathogens (e.g. clostridium, parasites, coliphages, etc.) and contaminants of emerging concern (e.g. herbicides, pesticides, pharmaceuticals, hydrocarbons, etc.).

The purpose of inclusion of the above data into the Freshwater assessment was to provide context on the environmental conditions of the study area.

3.2.2 Ecoregional Context, Catchment, and Ecological State

The AWRMS site falls within the Southwestern Coastal Belt Ecoregion described by Kleynhans *et al* (2005). This ecoregion is characterised by plains with a moderate to high relief, with altitudes varying from sea level to 900 m above sea level. There are significant levels of Fynbos, Succulent Karoo and Thicket, but the dominant vegetation type is West Coast Renosterveld. Most of the rainfall occurs in the winter months, with a moderate to low mean annual precipitation and a moderate to high coefficient of variation of annual precipitation.

The AWRMS infrastructure spans from Melkbosstrand in the south, Silwerstroom in the west, Mamre in the north and Atlantis in the east. The three conservation areas are the Atlantis Aquifer Nature Reserve, Koeberg Nature Reserve and the Ganzekraal Conservation Area. Furthermore, the AWRMS infrastructure falls within the greater Cape West Coast Biosphere Reserve. Other areas on the outskirts of the town of Atlantis are utilised for subsistence farming (largely livestock) and many areas are invaded by alien trees such as Acacias, Eucalyptus and Pine species. Although impacted, they are still classified as Ecological Support Areas (ESA) or Critical Biodiversity Areas (CBA) according to the City of Cape Town Biodiversity Network.

The study area in which the Atlantis Water Resource Management Scheme (AWRMS) infrastructure spans across three quaternary catchments (i.e. G21B, G21A and G21D), with the vast majority falling within the G21B quaternary catchment. (Refer Figure 6) which has a Mean Annual Precipitation (MAP) of 332mm and a Mean Annual Runoff (MAR) of 7.63 million cubic meters.

The primary surface drainage features in the study area are the Silwerstroom, Buffels, Donkergat and Sout Rivers. The Silwerstroom River is the only perennial river, while the rest are all non-perennial, drying up in the summer months. Figure 7 to Figure 13 portray the zoomed -in freshwater sensitivities of the AWRMS.

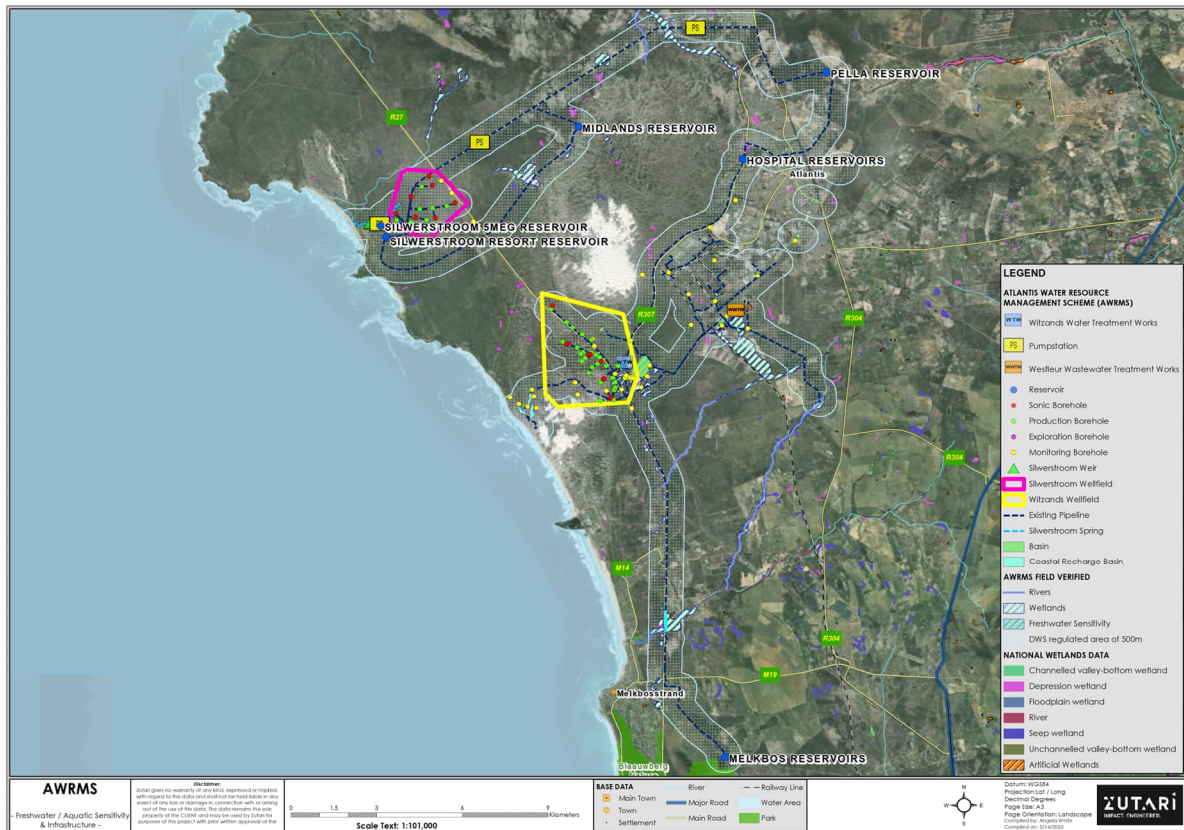


Figure 6: Location of AWRMS infrastructure within the G21B Quaternary Catchment.

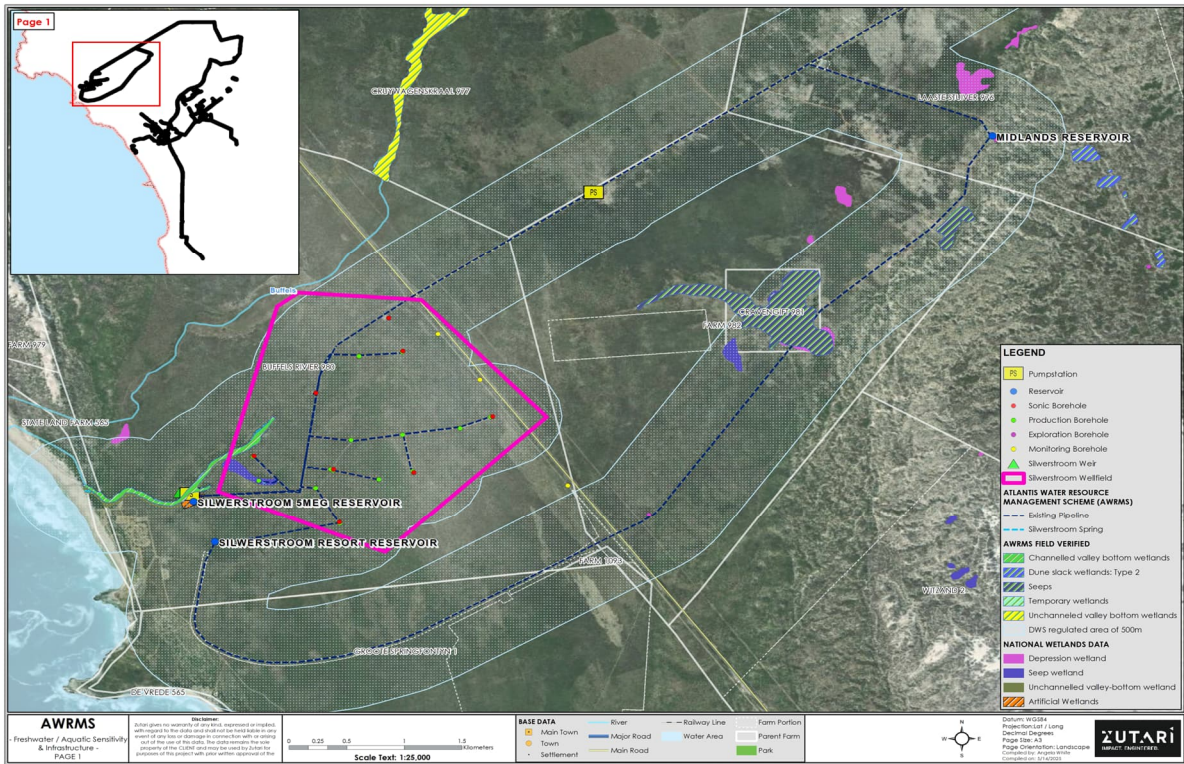


Figure 7: Zoomed in map of the North Western AWRMS infrastructure and freshwater sensitivities.

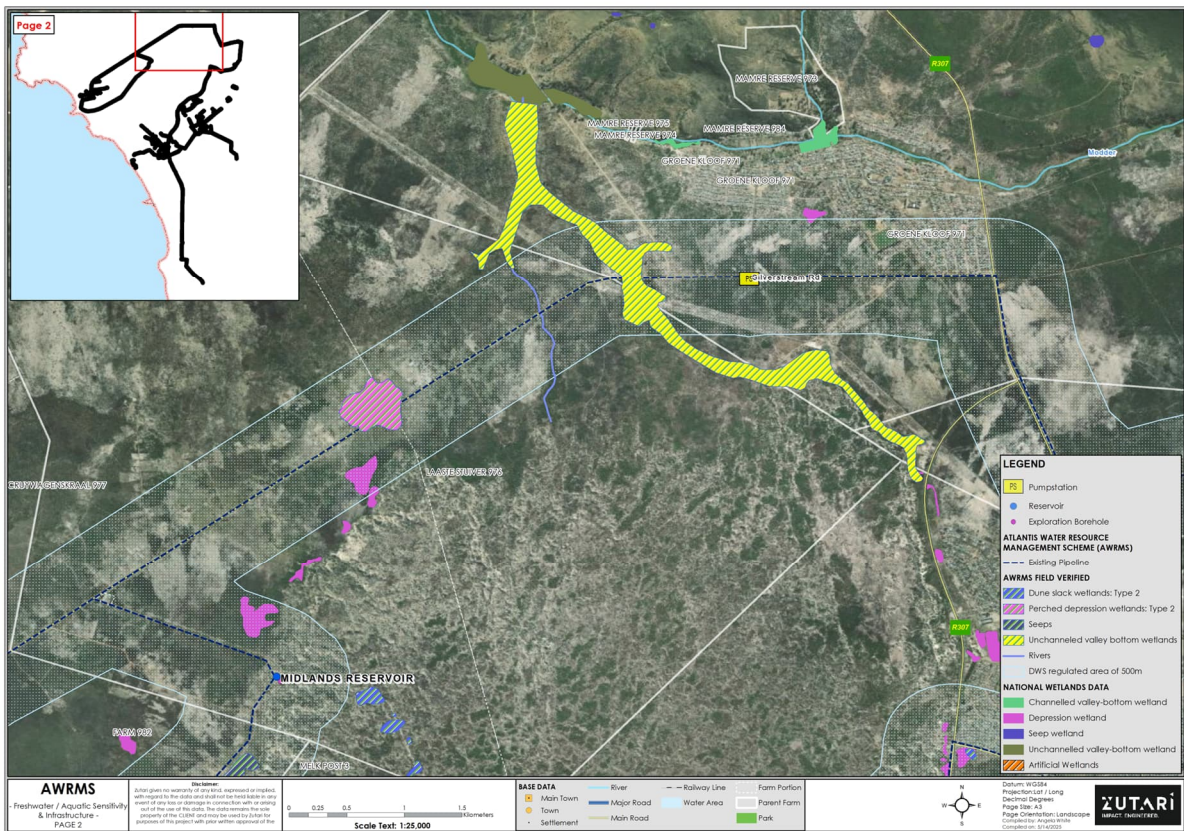


Figure 8: Zoomed in map of the Northern AWRMS infrastructure and freshwater sensitivities.

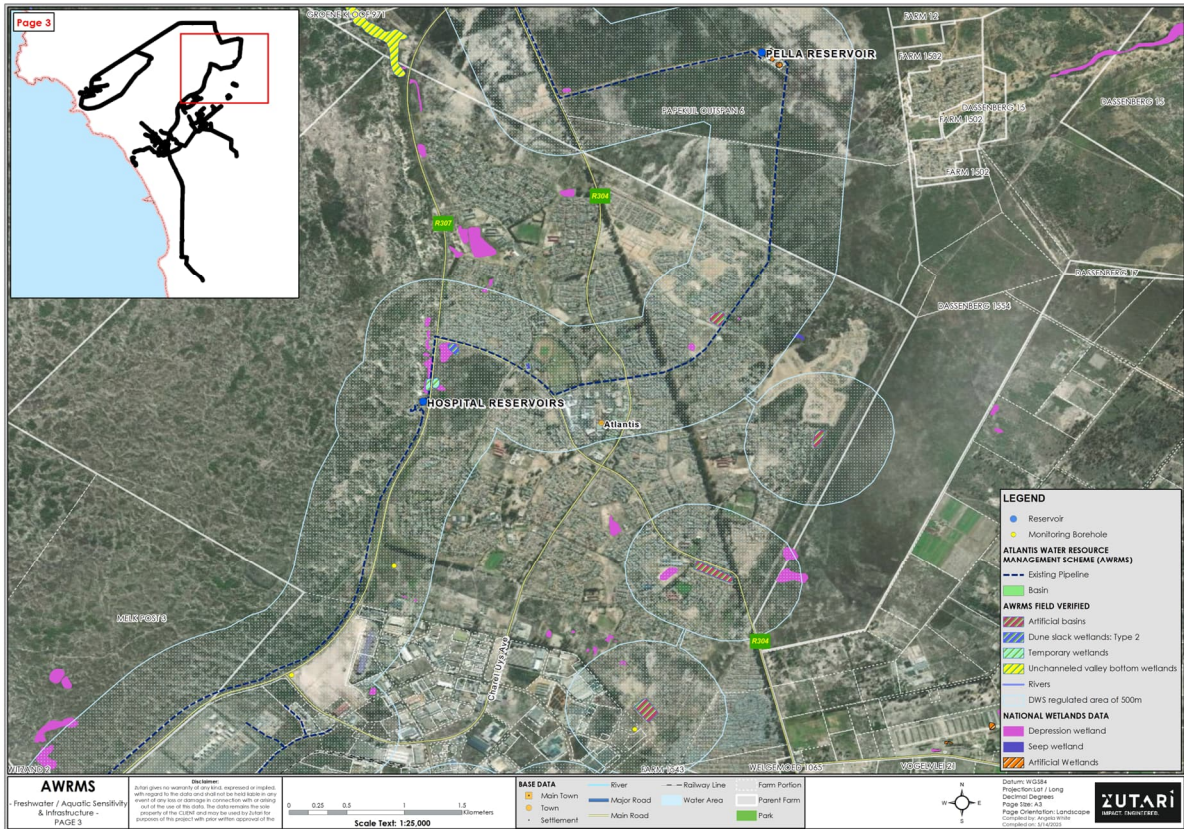


Figure 9: Zoomed in map of the North Eastern AWRMS infrastructure and freshwater sensitivities

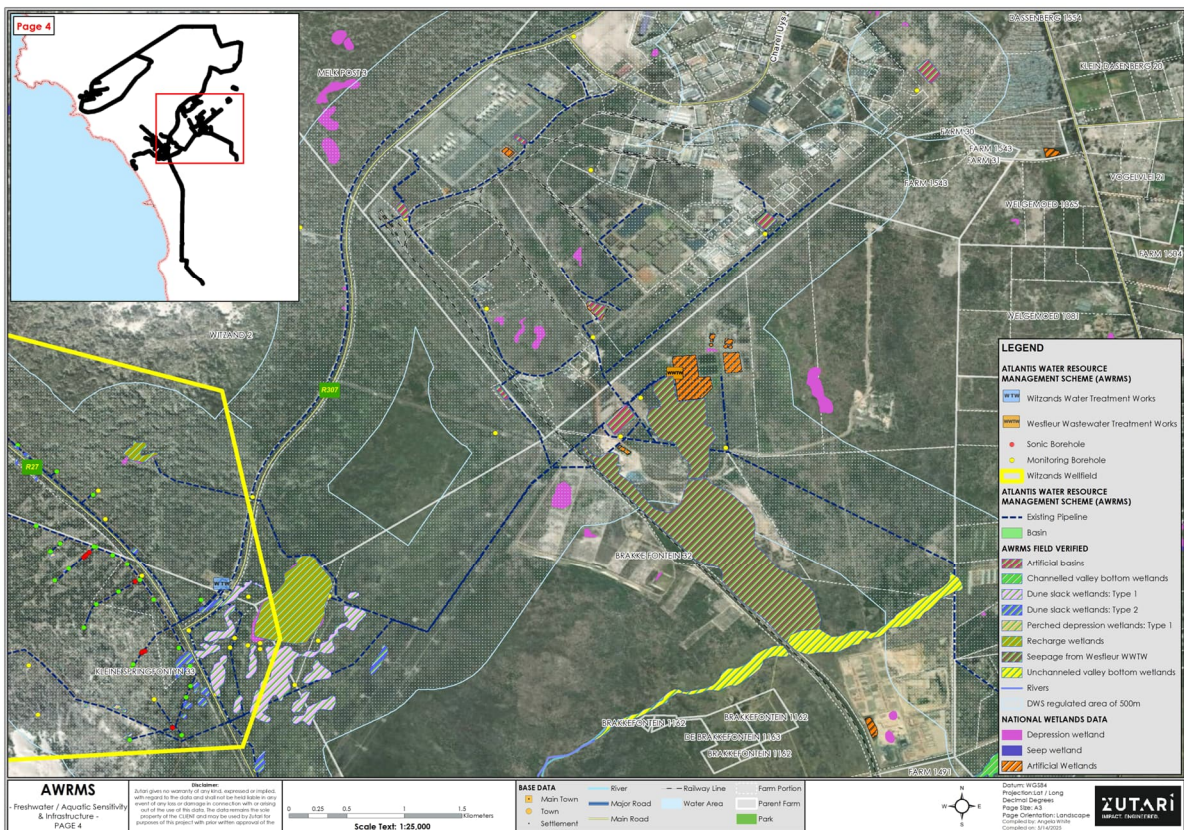


Figure 10: Zoomed in map of the eastern section of the AWRMS and freshwater sensitivities.

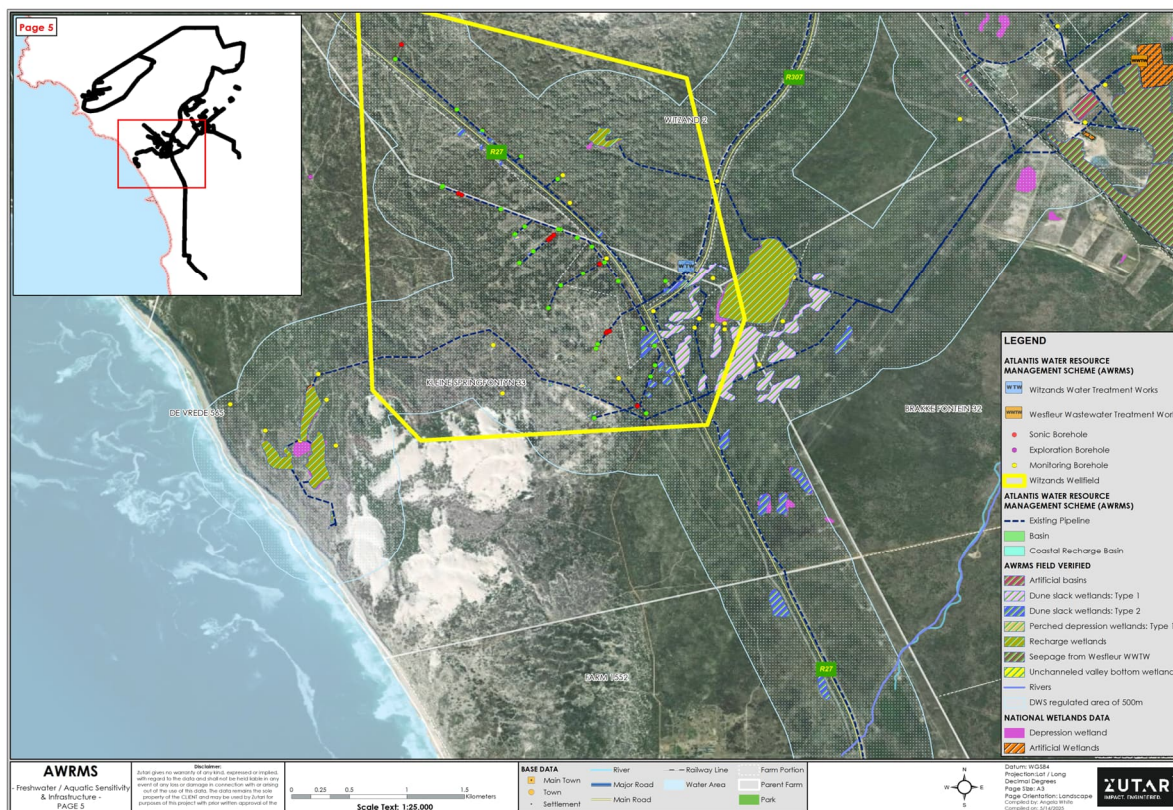


Figure 11: Zoomed in map of the central AWRMS infrastructure and freshwater sensitivities.

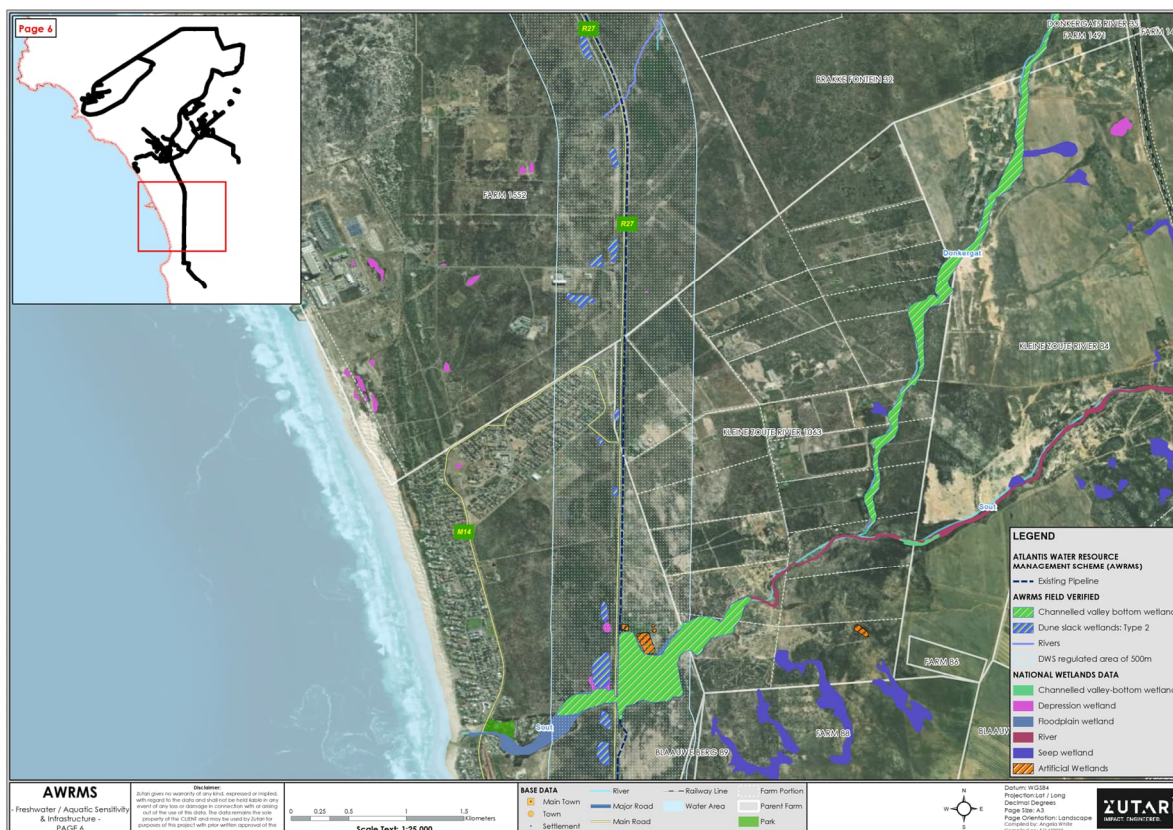


Figure 12: Zoomed in map of the Melkbos pipeline and freshwater sensitivities.

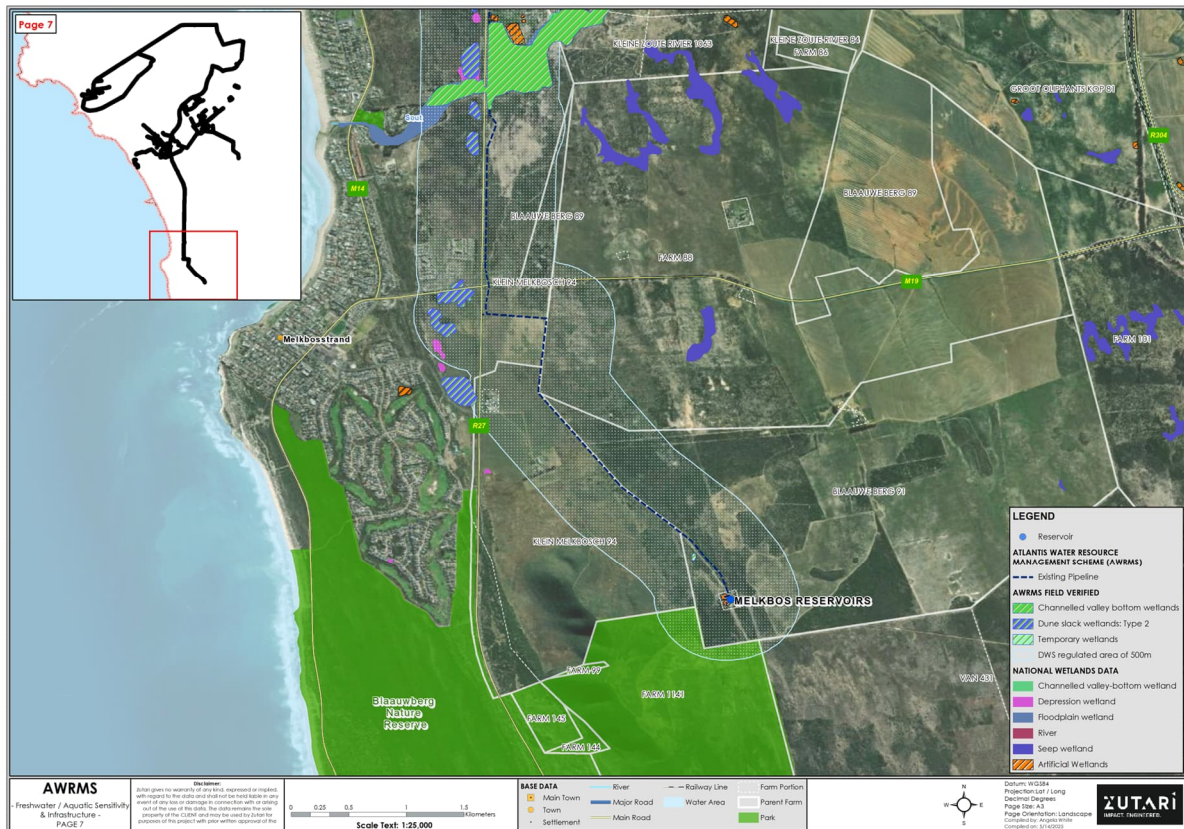


Figure 13: Zoomed in map of the Southern section of the Melkbos pipeline and freshwater sensitivities.

3.2.3 Wetlands

The existing Atlantis Water Resource Management Scheme (AWRMS) infrastructure spans across the G21B, G21A and G21D quaternary catchments in the Berg-Olifants Water Management Area (WMA) and the lower Berg sub-WMA in the City of Cape Town, Western Cape. Within the G21B quaternary catchment in particular, a significant portion of the area within which the AWRMS infrastructure is situated is protected formally or conserved and is thus largely pristine in nature.

The site verification (undertaken by Freshwater Consulting in October 2024 and February 2025) resulted in the identification of numerous wetlands within the DWS-regulated area of 500m. These wetlands are broadly categorised in Table 10. It must be noted that, although numerous inland aquatic ecosystems were identified within the DWS-regulated area (500m) of the existing AWRMS infrastructure, only a subset of rivers and wetlands are regarded as potentially affected aquatic ecosystems. Various aquatic ecosystems were excluded because they exist upslope of infrastructure or they are hydrologically isolated from the proposed maintenance activities i.e. there is a barrier (e.g. an impermeable road or dune) between the inland aquatic ecosystem and where the maintenance activity will be taking place. The potentially affected aquatic ecosystems that may be impacted by the proposed maintenance activities are shown on the series of maps numbered as Figure 7 - Figure 13 above and appended as Appendix B.2.

Potential impacts to rivers and wetlands can easily be minimised through the implementation of mitigation measures as outlined in Section 5 and Appendix C.1 of this EMMP. The recommended buffer for all inland aquatic ecosystems is 40m (on either side of the water resource) for the operational phase of the AWRMS. The buffer recommendation applies as a mitigation measure and as a no-go area for maintenance activities, except where activities must occur within or close to aquatic ecosystems. Where work occurs within a river or wetland, then the applicable mitigation measures, as proposed within this EMMP, must be implemented.

Table 10 AWRMS Wetlands

Aquatic feature	Description	Photographic Examples	
Artificial basins (Basin 1, 2, 3, 4, 5, 6, 8, 9, 10, 11)	These artificially excavated basins primarily store stormwater runoff from residential and/or industrial areas originating from the town of Atlantis.	 Photo of Basin 5 in the town of Atlantis	 Photo of Basin 11 in the town of Atlantis
Recharge Wetlands (Basin 7 and 12)	These modified, yet likely natural wetlands are used as the primary recharge areas of the AWRMS. They receive a mixture of treated effluent and stormwater and are typically permanently saturated and inundated. The seasonal edges are dominated by weedy species (e.g. <i>Sonchus</i> spp and <i>Xanthium</i> spp) and sedges (<i>Scirpoides holoschoenus</i>)	 Photo of Basin 7	 Photo of Basin 12
Recharge wetlands (coastal recharge basins)	It is unclear whether these coastal recharge basins were historically natural dune slack wetlands, however, they currently store and allow for the infiltration of treated industrial effluent as a means to prevent saltwater intrusion.	 Photo of the desilting basin as part of the Coastal Recharge Basin network	 Photo of one of several infiltration ponds as part of the Coastal Recharge Basin network

Aquatic feature	Description	Photographic Examples	
Dune slack wetlands	Type 1: These natural depression wetlands are associated with higher periods of saturation (and likely inundation) due to their close proximity to recharge wetlands described above. The presence of <i>Typha capensis</i> stands within their core is indicative of permanently saturated and seasonally inundated conditions.	 Photo taken of a wetland near Basin 7	 Photo taken of a wetland near Basin 7
Dune slack wetlands	Type 2: These natural depression wetlands are typically located further away from recharge basins and are assumed to be largely isolated (hydrologically) from AWRMS activities. The plant communities are distinctly different to Type 1 in that they are grass-dominated with sedges such as <i>Ficinia spp</i> and <i>Scirpoides holoschoenus</i>. Various other dune slack wetlands (similar to those described here) are located within the Witzands Nature Reserve, but are dominated by alien invasive, Coastal Wattle (<i>Acacia cyclops</i>), but do support wetland sedges (<i>Ficinia</i> and <i>Juncus spp</i>) and grasses (e.g. Cogon Grass (<i>Imperata cylindrica</i>).	 Photo of a dune slack wetland in Koeberg Nature Reserve (near borehole AT-P09/W34006)	 Photo of a dune slack wetland near electricity infrastructure (near Brakkefontein Road)
		 Photo of a dune slack wetland in Witzand Nature Reserve (near borehole AT-EX18)	 Photo of a dune slack wetland in Witzand Nature Reserve (near borehole AT-EX18)

Aquatic feature	Description	Photographic Examples	
Perched depression wetlands	Type 1: These natural depression wetlands are protected within nature reserves and are largely unimpacted. They do however lie adjacent to dirt roads that allow for access to various boreholes. They are situated on a clay lens and receive runoff from overland flow. They are dominated by various kinds of grasses as well as clumps of sedges (e.g. <i>Ficinia</i> spp and <i>Scirpoides holoschoenus</i>).	 Photo of a perched wetland in the Koeberg Nature Reserve between boreholes AT-MON24 and AT-S01	 Photo of a perched wetland in the Koeberg Nature Reserve between boreholes AT-MON24 and ATS01
Perched depression wetlands	Type 2: These natural depression wetlands are not protected within nature reserves and are largely located within subsistence farming communities where they experience overgrazing by goats, horses and cattle. Similarly, these systems are located on a clay lens and fed by overland runoff.	 Photo of a depression wetland along Silverstream Road	 Photo of a depression wetland along Silverstream Road
Silverstream channelled valley bottom wetland	This natural wetland is mainly fed by lateral ingress of groundwater from the surrounding dunes via two main springs as well as surface water runoff. The wetland is dominated by <i>Phragmites australis</i> within its midsections whereas further upstream, other indigenous plants include <i>Senecio halimifolius</i>, <i>Cyperus rotundus</i>, <i>Imperata cylindrica</i>, <i>Ficinia nodosa</i>, <i>Helichrysum</i> sp. and <i>Morella cordifolia</i>. Some alien plants include Watercress (<i>Nasturtium</i> spp) and Duckweed (<i>Lemna</i>).	 Photo of the wetland upslope of the in-channel dam	 Photo of the wetland immediately downstream of the Silverstream weir and pump house

Aquatic feature	Description	Photographic Examples	
Seeps	These wetlands occur immediately adjacent to the Witsand dunes and are likely fed by daylighting groundwater. Although situated in an area that is utilised by subsistence farming communities, they support dense and diverse stands of indigenous vegetation including <i>Senecio halimifolius</i>, <i>Cliffortia</i> spp, <i>Carpha glomerata</i> and <i>Isolepis prolifera</i>. Some invasion of <i>Acacia cyclops</i> was observed in some parts.	 Photo of a seep wetland situated west of the Witzands Aquifer Nature Reserve along the Silwerstroom pipeline route	 Photo of an extensive seep wetland situated west of the Witzands Aquifer Nature Reserve along the Silwerstroom pipeline route
Seepage from Wesfleur WWTW	An artificial wetland that has originated due to seepage from the unlined maturation ponds. Closest to the maturation pond, large swathes of <i>Typha capensis</i> and <i>Phragmites australis</i> are present. Beyond these swathes and towards the edge of the temporary wetland habitat, the vegetation community is dominated by alien plants (e.g. <i>Acacia saligna</i> and <i>Cenchrus clandestinus</i>) as well as indigenous plant species (e.g. <i>Osteospermum incanum</i> and the <i>Ficinia nodosa</i>). Further downstream, it is heavily affected by sand mining activities.	 Photo of the artificial wetland immediately south of the Wesfleur WWTW maturation ponds	 Photo of the artificial wetland further downstream of the Wesfleur WWTW maturation ponds

Aquatic feature	Description	Photographic Examples	
Unchanneled valley bottom wetland below a chicken farm	This wetland originates below a chicken farm and is likely fed by daylighting groundwater (Kobus Prinsloo, geohydrologist at Umvoto). At its core, it is dominated by the indigenous sedge, <i>Bolboschoenus maritimus</i> . The plant community changes to comprise <i>Cenchrus clandestinus</i> , <i>Rumex crispus</i> , <i>Senecio spp</i> and <i>Lolium spp</i> further downstream. wetland edges are starting to become invaded by <i>Acacia cyclops</i> and <i>Acacia saligna</i> .	 Photo of the start of the wetland system immediately south of the chicken farm	 Photo of the wetland system further downstream of the chicken farm.
Koerassie unchanneled valley bottom wetland	This wetland is heavily grazed – especially near its midsections where a subsistence farming community resides. The vegetation community is comprised largely of overgrazed grasses (e.g. <i>Cynodon dactylon</i>) and sedges as well as alien trees (<i>Acacia cyclops</i> and <i>Acacia saligna</i>).	 Photo of the wetland system along Silverstream Road (looking downstream)	 Photo of the wetland system along Silverstream Road (looking downstream)
Temporary wetlands	Various temporary wetlands were identified and are likely sustained by overland flow from their upper catchments. These wetlands are dominated by grasses and stands of <i>Scirpoides holoschoenus</i> .	 Photo of temporary wetland habitat upslope of the pipeline that carries water from borehole W34018/W34020 within the Silverstroom Wellfield	 Photo of temporary wetland habitat – with a dense stand of sedges immediately downslope of the darker vegetation in the background.

Aquatic feature	Description	Photographic Examples	
Sout River channelled valley bottom wetland	The Sout River is a perennial river system located lower down in the catchment and receives treated effluent which impairs the water quality. The Sout River receives inputs from the Melkbos WWTW and is dominated by <i>Phragmites australis</i> - at which point it forms a channelled valley bottom wetland.	 Photo of the Sout River taken from the bridge crossing West Coast Road (looking upstream)	 Photo of the Sout River taken from the bridge crossing West Coast Road (looking downstream)
Rivers (Langwaterspruit and the Brakkefont-ein Road stream)	These river systems are non-perennial in nature and are fed by overland flow during periods of high rainfall. They flow through areas which are impacted by agricultural and mining activities. They support largely weedy species, such as grasses and alien Acacia trees.	 Photo of the Langwaterspruit River along Silverstream Road (looking downstream)	 Photo of the Brakkefontein Road River along West Coast Road (looking upstream)
Donkergat River channelled valley bottom wetland	The wetland habitat associated with the Donkergat River is dominated by kweek grass (<i>Cynodon dactylon</i>), Curley Dock (<i>Rumex crispus</i>), alien Acacia trees and kikuyu grass (<i>Cenchrus clandestinus</i>). The channel section receives treated effluent as part of the AWRMS system and is dominated by bullrushes (<i>Typha capensis</i>). Alien Acacias have established well on the channel banks	 Photo of the wetland habitat upslope of the discharge point into the channel	 Photo of the Donkergat River wetland near the discharge point into the channel (looking downstream)

Aquatic feature	Description	Photographic Examples	
Unchanneled valley bottom wetland in Ganzekraal Conservation Area	This wetland is well grazed with evidence of livestock trampling within the wetland, and minor excavations to allow for the accumulation of water for stock watering. The vegetation community is comprised largely of plants such as <i>Isolepis prolifer</i>, <i>Juncus lomatophyllus</i> and pockets of <i>Typha capensis</i> within the wet core, which are surrounded by grasses such as <i>Cynodon dactylon</i> as well as alien trees (<i>Acacia cyclops</i> and <i>Acacia saligna</i>).	 Unchanneled valley bottom wetland within the Ganzekraal Conservation Area	 Unchanneled valley bottom wetland within the Ganzekraal Conservation Area

3.3 Vegetation

According to the Vegetation Map of South Africa, Lesotho and Swaziland (VEGMAP) (SANBI, 2024 Beta Version) four vegetation types occur in the areas where the AWRMS infrastructure is located, namely (i) Atlantis Sand Fynbos, (ii) Cape Flats Dune Strandveld, (iii) Cape Flats Sand Fynbos and (iv) Swartland Shale Renosterveld (Figure 14), with the former two vegetation types mapped as the most dominant across the AWRMS.

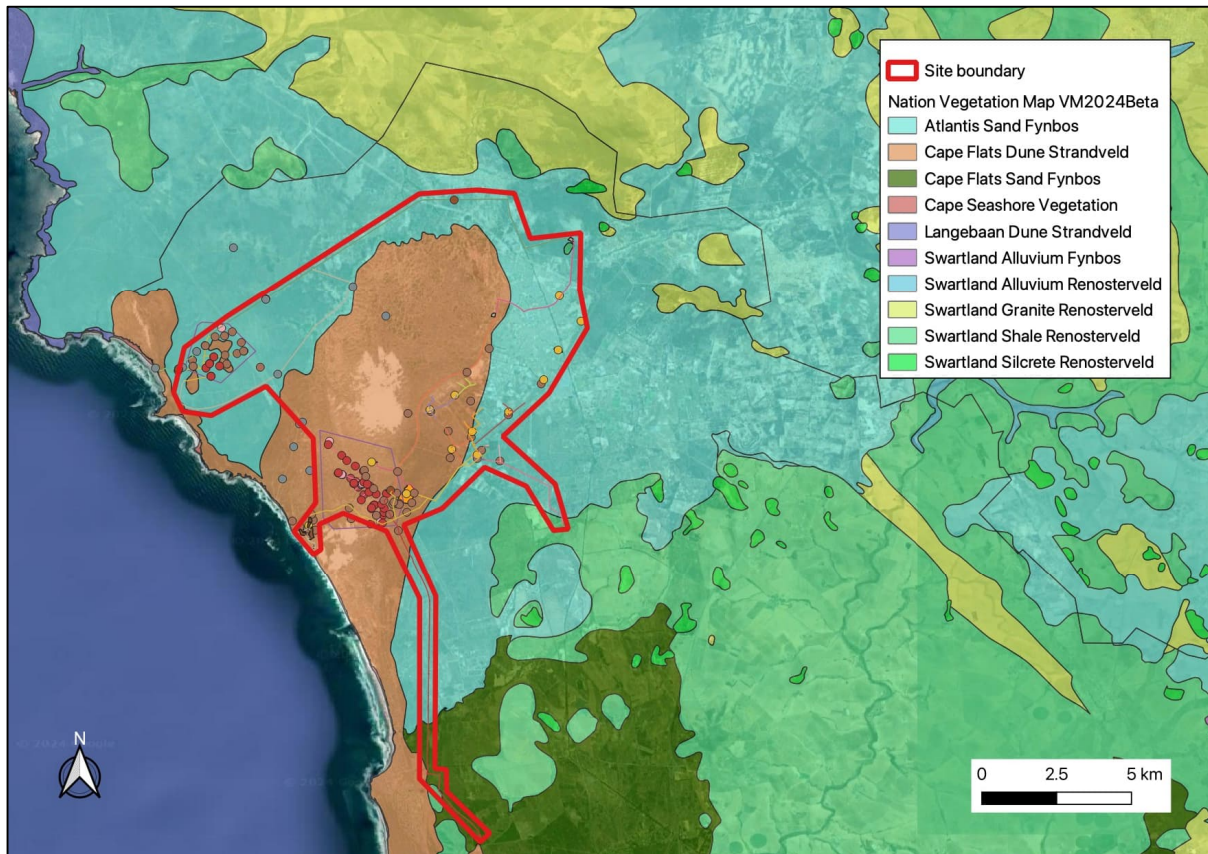


Figure 14: Vegetation Map: The vegetation types within the western side of the study area according to The Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2024 Beta Version) overlaid on a Google Maps™ aerial image.

The site verification (undertaken by Capensis in November 2024) confirmed that the Atlantis Sand Fynbos and Cape Flats Dune Strandveld are the most dominant vegetation types in relation to the locations of the AWRMS infrastructure, with each type covering ~50% of the area. The vegetation in the various areas across the AWRMS were given sensitivity ratings, as indicated by the maps in Figure 15 to Figure 21, and appended as Appendix B.3.

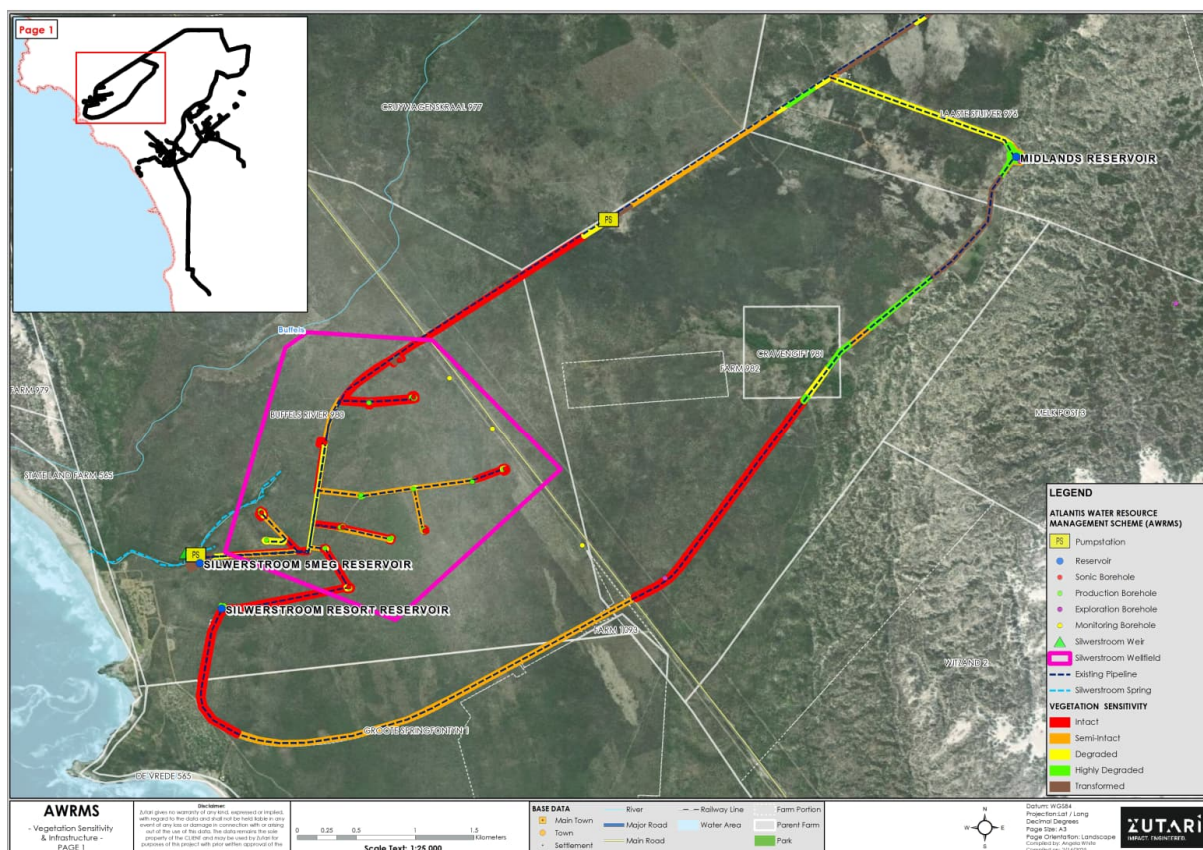


Figure 15: Zoomed in map of the North-Western AWRMS and vegetation sensitivities.

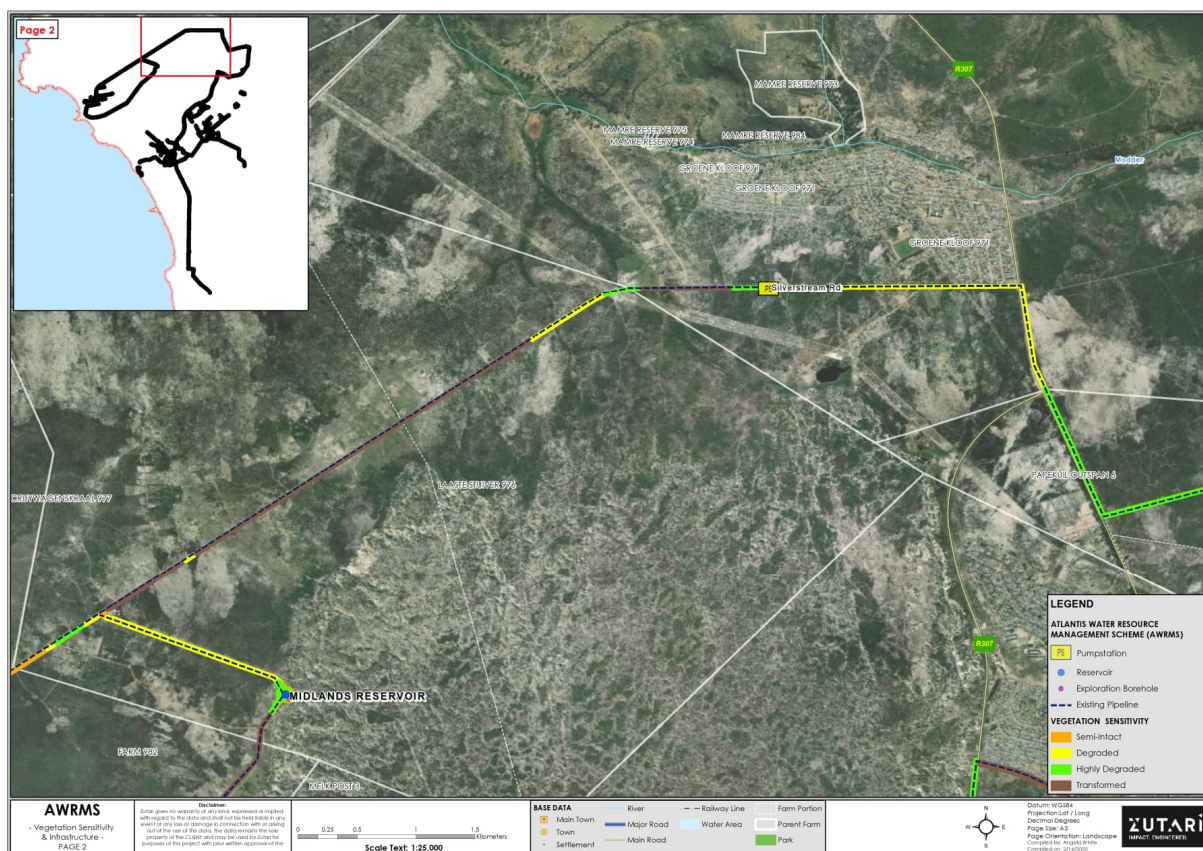


Figure 16: Zoomed in map of the Northern AWRMS and vegetation sensitivities.

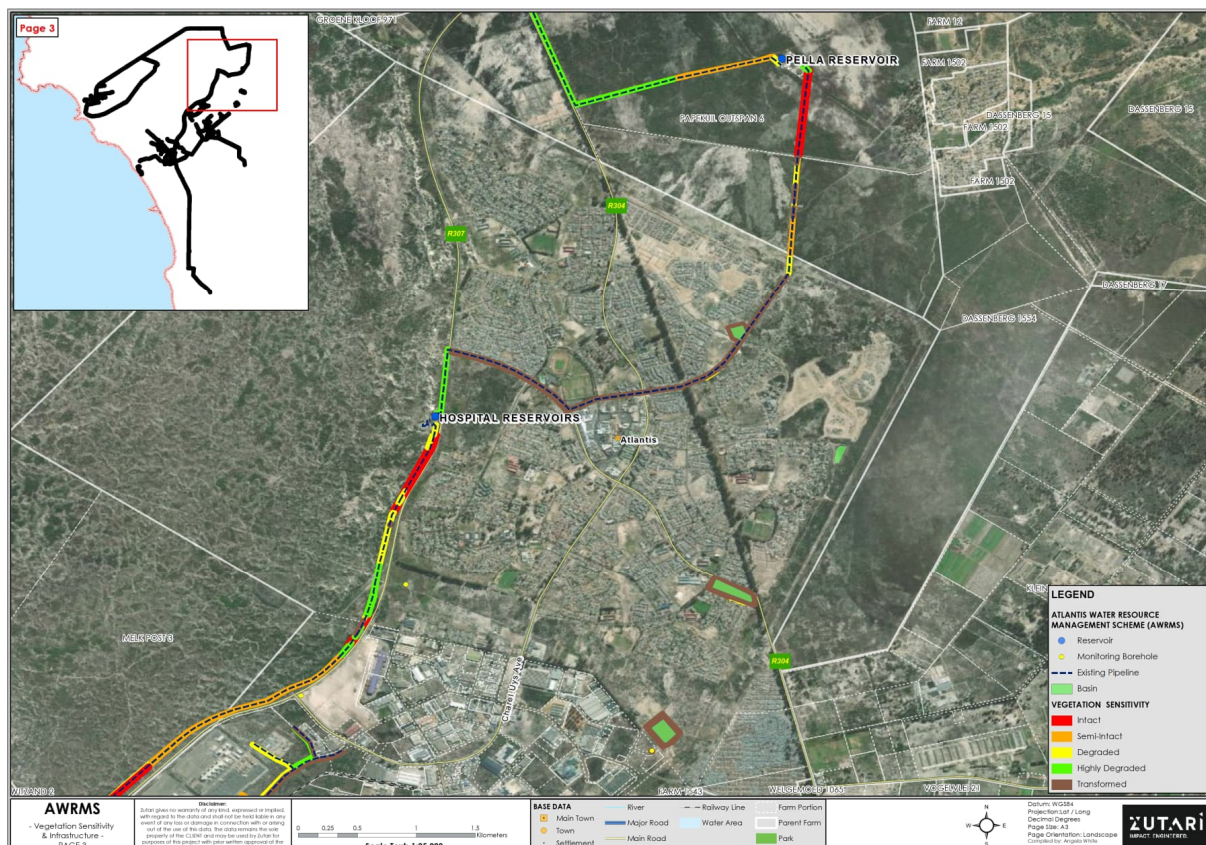


Figure 17: Zoomed in map of the North Eastern AWRMS and vegetation sensitivities.

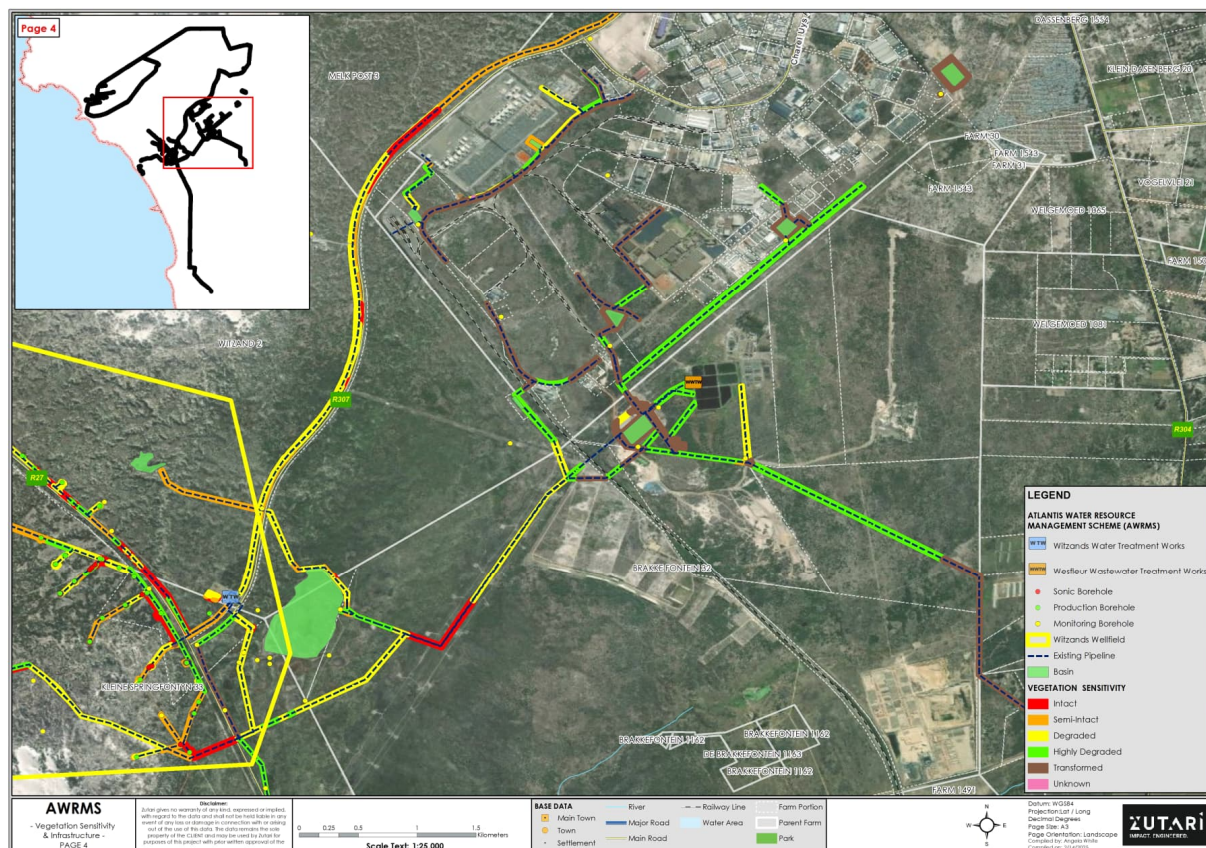


Figure 18: Zoomed in map of the central AWRMS infrastructure and vegetation sensitivities.

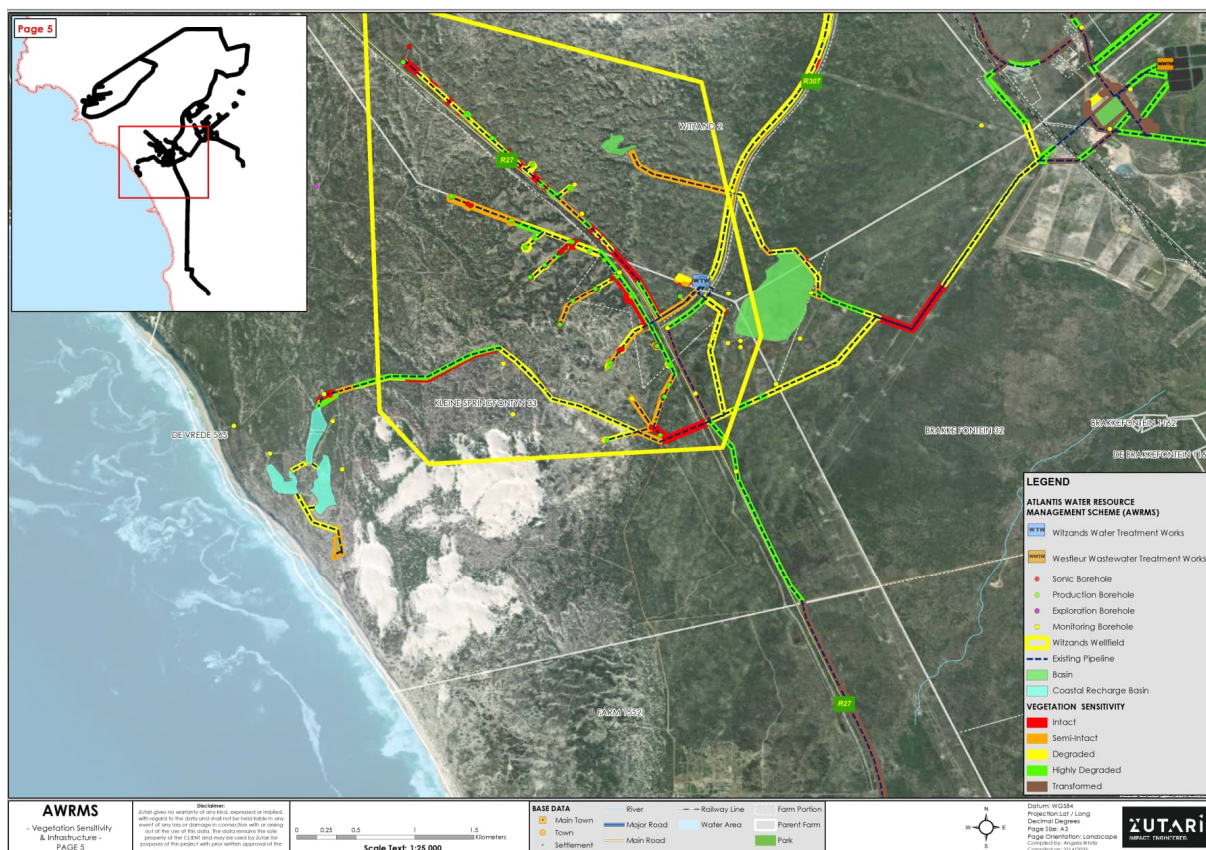


Figure 19: Zoomed in map of the South Eastern AWRMS infrastructure and vegetation sensitivities.

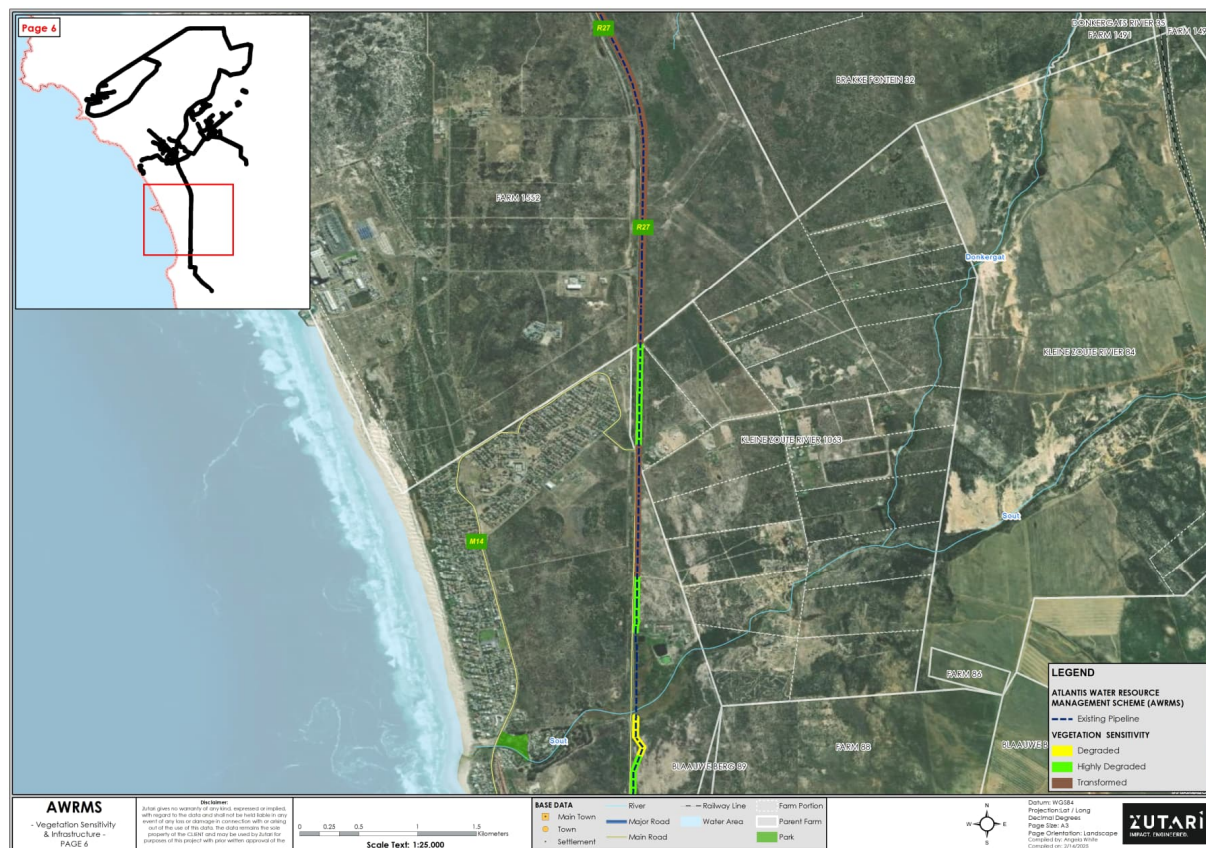


Figure 20: Zoomed in map of the Melkbos Pipeline and vegetation sensitivities.

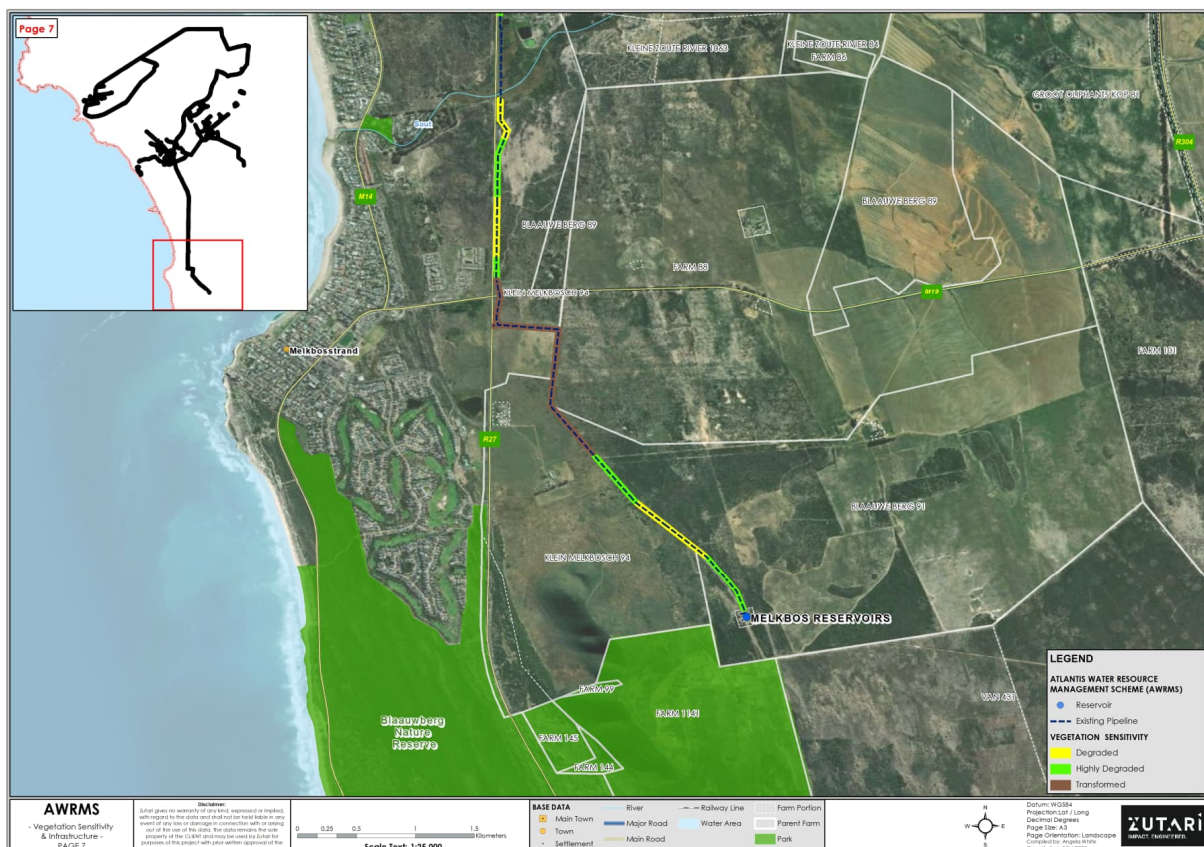


Figure 21: Zoomed in map of the Southern Melkbos pipeline and vegetation sensitivities.

The oversight of a botanical specialist is recommended for work taking place in areas with a 'Medium' or 'High' sensitivity rating, as indicated in

Table 11 below.

Table 11: Criteria for deriving sensitivity.

Sensitivity rating	Description	Habitats & Features	MMP requirements
Very Low	Transformed areas with no remaining natural vegetation.	ASF/CFDS/ASF/SSR.	No specialist oversight
Low	Degraded and Highly degraded vegetation (Endangered or Critically Endangered ecosystem).	ASF/CFDS/ASF/SSR.	No specialist oversight
Medium	Degraded vegetation (Endangered or Critically Endangered ecosystem).	ASF/CFDS/ASF/SSR.	Specialist oversight
High	Intact, Semi-intact to Intact, and Degraded to Intact (Endangered or Critically Endangered ecosystem).	ASF/CFDS/ASF/SSR.	Specialist oversight
ASF = Atlantis Sand Fynbos; CFDS = Cape Flats Dune Strandveld; CFSF – Cape Flats Sand Fynbos; SSR = Swartland Shale Renosterveld.			

3.4 Heritage, Culture and Palaeontology

The AWRMS is situated across areas of Very High, Moderate and Low palaeontological sensitivity (Figure 22). The pipelines and powerlines were placed at varying, but relatively shallow depths. The basins were excavated to varying, but relatively shallow depths. The boreholes mainly only penetrated the sandy layer, which is approximately 60m deep, but affected a very small area (borehole diameters are between ~50mm to 305mm).

There are not expected to be any heritage impacts associated with the operational phase (water abstraction).

No built heritage resources are anticipated to be impacted by the proposed maintenance and repair of the AWRMS.

See Section 2.4.2 above for details regarding various Notices of Intent to Develop (NIDs) which were completed and submitted to Heritage Western Cape for various AWRMS upgrade and refurbishment works, as well as for the proposed maintenance works authorised by this EMMP. In all cases, no further studies were deemed necessary.

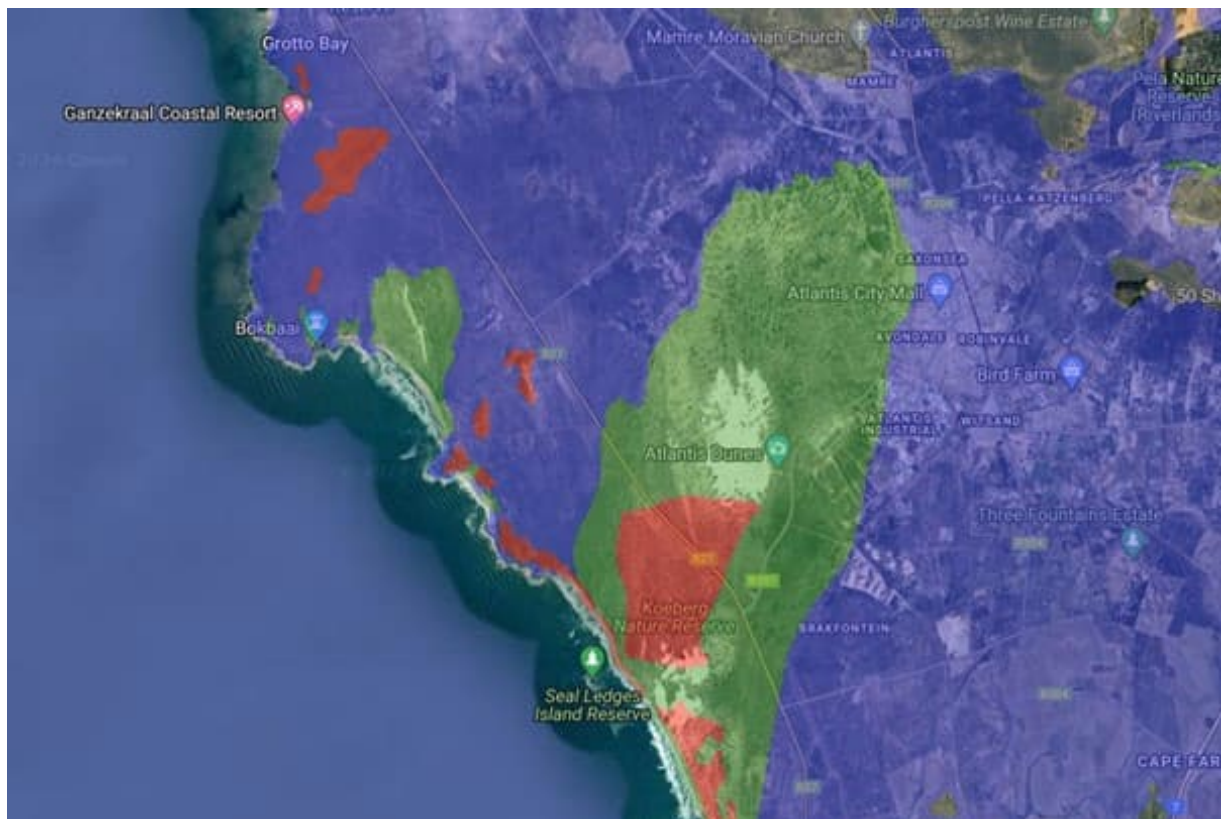


Figure 22: Palaeontological sensitivity map (Red: Very High sensitivity, green: Moderate sensitivity, blue: Low sensitivity)

4 IMPLEMENTATION OF THIS DOCUMENT

The EMMP is intended for use by the Proponent (the CCT), Contractors, and Environmental Control Officers (ECO). This document provides the framework for environmental management, where issues, actions and responsibilities associated with the general activities on the site/s are defined. The site-specific requirements relevant to the site in question, as per the site-specific information (Appendix B) of this report, shall be implemented as part of the EMMP. The EMMP is also to be read in conjunction with the relevant health and safety legislation, plans and guidelines. The general principles contained within the EMMP shall apply to the lifecycle of the reconstruction and maintenance activities, and all site activities shall be undertaken in such a manner as to minimise impacts on the biophysical and socio-economic environment.

The EMMP is a dynamic document implying that information gained during site activities and/or monitoring of procedures on-site can lead to changes in the EMMP, but these changes or inclusions will need to be approved by the DFFE before they can be implemented.

The following subsections set out the roles, responsibilities and functions of each role player, staff induction training, and the housing of the EMMP and associated permits/authorisations. Mitigation measures are provided in Table 13 of which relevant sections must be drawn into the Method Statement (Appendix H.1).

4.1 Roles and Responsibilities

4.1.1 Names and Details of Role Players

Table 12: Names and detail of role players

Proponent:	City of Cape Town
Contact Person:	Zwelethu Piliso
Role:	Senior superintendent Witsands Water Treatment Works / Manager of the Atlantis Water Scheme Utility Service – Bulk Water
Email:	Zwelethu.Piliso@capetown.gov.za
Tel.:	T: 021 444 9180 M: 082 378 7774
Competent Authority:	Department of Fisheries, Forestry and the Environment
Contact Person:	Thulisile Nyalunga
Role:	Case officer
Email:	TNyalunga@dfpe.gov.za
Tel.:	DFPE call centre: 086 111 2468

4.2 Responsibilities and Functions of Role Players

4.2.1 The Proponent

The Proponent (the CCT) is the landowner who is responsible for the management of all assets on properties owned by the CCT. For CCT owned infrastructure located on non-CCT owned properties (e.g., Koeberg Nature Reserve, which is owned by Eskom), the CCT shall be responsible for

maintenance of infrastructure under the specific agreements in place with the relevant landowners. In the context of this document, the CCT shall be responsible for the planning and funding of the reconstruction and maintenance activities which will be undertaken by the relevant Contractor, or relevant CCT Branch.

The Proponent shall be responsible for ensuring that other role players fulfil their obligations in terms of the requirements of this EMMP:

- The Proponent shall ensure that the Contractor that will undertake the maintenance activities is well versed in the contents of the EMMP and in the conditions of the water use authorisation and shall take such measures that are necessary to bind such persons to the conditions of the EMMP.
- The Proponent shall appoint a suitably experienced ECO before commencement of reconstruction or maintenance activities contained herein to ensure compliance with the provisions of the EMMP. Where minor works take place in areas with low environmental sensitivity, the Site Agent can perform the function of monitoring compliance if it is deemed that an ECO is not necessary.
- The Proponent shall obtain and comply with all the necessary approvals, permits, authorisations and requirements set by the relevant National and Provincial Departments, and Local Authority for the reconstruction and maintenance activities before any site preparation activities are undertaken.
- The Proponent shall notify the DFFE of their intention to undertake NEMA listed activities under the approved EMMP.

4.2.2 The Contractor

The Contractor, in the context of this document, refers to the external contractor or relevant CCT Branch responsible for the repair and maintenance activities. The Contractor shall be responsible for ensuring the day-to-day implementation of the EMMP during the lifecycle of the repair and maintenance activities, and shall be well-versed in the contents of this document:

- The Contractor shall confirm that all the relevant environmental authorisations, permits and/or licenses are in place prior to commencing with any site activities, the conditions of which (e.g., a WUL) shall be brought to the attention of all persons (employees, sub-consultants, etc.).
- The Contractor shall liaise closely with the ECO on any environmental management issues, incidents or emergencies.
- The Contractor shall ensure that the works on-site are conducted in an environmentally sensitive manner and in accordance with the requirements of the EMMP. Special care shall be taken by the Contractor to prevent irreversible damage to the environment.
- The Contractor shall ensure all work areas, stockpiles and facility locations are located in a manner that complies with the relevant legislation and the requirements of the EMMP.
- The Contractor shall ensure that all staff are adequately informed of the requirements of the EMMP pertaining to their site role, and that they have attended an environmental induction training session (this session must be in the form of a talk and/or a written code of conduct that is clearly explained to and understood by the team).
- The Contractor shall ensure that any subcontractors or visitors to the site are conversant with the EMMP or relevant chapters of the EMMP pertaining to their role on-site.
- The Contractor shall conduct activities in a manner that will cause the least possible disturbance to the existing amenities, whether natural or man-made, in accordance with all the currently applicable statutory requirements. Disturbance or disruption of the daily lives of local communities shall be avoided as best as practically possible.

- The template for the method statement for the maintenance practices is attached hereto as **Appendix H.1**. The Contractor shall compile the method statement and submit it to the ECO and/or Site Agent for approval.
- The Contractor shall allow officials from DFFE access to the site/s for the purposes of compliance monitoring in terms of the approved EMMP.
- The Contractor shall ensure that the site/s is/are rehabilitated and reinstated in accordance with the requirements of the EMMP.
- Appendix I.1 contains the Emergency Response Plan that needs to be always adhered to.
- If required, the Contractor may establish a site yard at a location agreed upon with the relevant CCT Branch.

4.2.3 The Environmental Control Officer (ECO)

The ECO in the context of this document refers to the party responsible for the environmental compliance and auditing activities required by the EMMP for the lifecycle of the reconstruction and maintenance activities. The ECO shall be appointed by the Proponent, and the designation shall be reserved for a suitably qualified (National Diploma/Degree in Natural Science or an equivalent qualification), independent person. The ECO shall have adequate environmental knowledge to understand the detailed environmental issues associated with the project, and is to be well versed in the contents of the EMMP and its associated reports:

- The ECO shall undertake all inspection, monitoring and auditing tasks associated with the repair and maintenance activities to ensure compliance with the approved EMMP and Method Statement, as described in the relevant chapters of this report (and dependent on whether repair or routine maintenance activities are being undertaken).
- The ECO shall liaise closely with the Contractor, and shall provide guidance on any environmental management issues, incidents or emergencies that are brought to their attention.
- The ECO shall review and sign off on the repair and maintenance method statement, the required format of which is attached hereto as **Appendix H.1**
- The ECO shall assist in providing recommendations for remedial action in the event of any non-compliances.
- The ECO shall liaise with the DFFE and other relevant internal line functions on all matters requiring such liaison, to the discretion of the ECO.
- The ECO shall ensure compliance with any reporting requirements contained in the department's approval of this EMMP.

4.3 Staff Induction Training

These measures will ensure site staff become familiar with the environmental management requirements for the site and behave in an environmentally conscientious manner:

- The Contractor shall ensure that all site workers, plant operators, drivers and anyone under their employ receive the induction training course prior to commencing with any site activities.
 - o The induction training material shall address, but not be limited to, the Code of Conduct, basic environmental awareness, basic health and safety awareness, prevention of water, soil, and air pollution, prevention of soil erosion and sedimentation, basic principles of materials handling and storage, fire risks, protection of fauna and flora, emergencies and incident responses, spill response provisions, social responsibility, administrative and reporting procedures.

- o Relevant chapters of the EMMP and approved Method Statement shall be presented during this course to facilitate compliance.
- o Proof of completing such training shall be provided to the ECO (attendance register or similar).
- o Appropriate supervision shall be provided, dependant on the scale of the operations.

The performance of site staff, in terms of meeting the environmental requirements of this EMMP shall be monitored on an on-going basis. Any shortcomings shall be addressed constructively and proactively through appropriate communication and training.

4.4 Housing the EMMP and Associated Permits / Authorisations

The EMMP and all associated permits/authorisations shall be kept together and be readily available at the Witzands Water Treatment Plant. These documents shall accompany the Contractor to site during any maintenance or repair activities.

5 ENVIRONMENTAL MANAGEMENT REQUIREMENTS FOR MAINTENANCE AND REPAIR ACTIVITIES ASSOCIATED WITH THE ATLANTIS WATER RESOURCES MANGEMENT SCHEME AND ASSOCIATED INFRASTRUCTURE

Table 13: Method statement that describes immediate proposed tasks, and assessment of their impacts

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
Maintenance and repair in the context of this document means routine or emergency actions performed to keep a structure or system functioning or in service in the same location, capacity, and footprint. The requirements of this Chapter are only relevant to maintenance and repair activities but shall be read in conjunction with Chapters 1 - 3 of the EMMP.				
5.1 Administrative Requirements				
5.1.1 Initial Maintenance Project Meeting	N/A	N/A	An initial project meeting shall be held between the ECO and the Contractor to: • Ensure all parties have full sets of this EMMP and any other documentation or plans required. • Discuss the required reconstruction and maintenance work. • Discuss communication channels including contact details for relevant parties.	The Contractor is required to adopt the method statements provided in this EMMP. Should the mitigation measures not be implemented according to this EMMP, the Contractor will be liable for the damages caused due to his negligence. The ECO will also advise and/or recommend remedial actions should these mitigation measures

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
				not be implemented accordingly. This is applicable to all actions regarding the Maintenance Activities.
5.1.2 ECO Monitoring & Reporting	N/A	N/A	The following communication procedures apply to the responsibilities of the ECO during the maintenance activities: • Once the maintenance of the respective infrastructure is concluded, the ECO shall inspect the work. • The ECO shall compile a General Progress Report following any routine or emergency maintenance activities, which can be in the form of a checklist and/or diary entries (or similar), but shall include: i) A dated photographic record. ii) A record of any environmental incidents or non-compliances. The compliance chapter of the report shall record the nature of any environmental queries/issues/incidents, the instructions on remedial actions to be undertaken, and the disciplinary actions prescribed. The record shall continue on a monthly basis until such time as the incident has been closed out, and the final record on the matter shall reflect on the remedial actions taken and the dates of eventual compliance by the Contractor. iii) Minutes of any site inspections, or of meetings pertaining to environmental incidents, or of non-compliance with this EMMP.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			The ECO shall submit all reports on the maintenance activities to DFFE, the Proponent and the Contractor.	
5.1.3 Emergency Reporting & Procedures	- Accidental fire - Accidental leaks - Accidental spillage of pollutants	N/A	The following emergency reporting and procedures will minimise the risk associated with emergency events: - The Contractor shall ensure that their employees are aware of the procedure to be followed for dealing with, and reporting emergencies, including accidental fire, which shall include notifying the relevant authorities of the event: i) All site staff shall be briefed regarding the requirements for dealing with potential emergencies including fires, accidental leaks and spillage of pollutants. ii) Education of site staff shall focus not only on the prevention of emergencies but also on proactive and appropriate interventions where such emergencies occur. - The contact details of the nearest hospital, police and ambulance services (Refer Contact List Page 6 of the EMMP) shall be made available to staff whilst undertaking any repair or maintenance work on site. - Emergency equipment including spill kits and fire extinguishers shall accompany staff to site for the duration of the maintenance activities.	
5.1.4 Method Statements	N/A	N/A	The Contractor shall review, adopt, and sign off on the provided method statement/s, a template for which is attached hereto as Appendix H.1 . Any deviations from the methods described herein shall be submitted to the DFFE before commencement of the activities.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
5.1.5 Record Keeping	N/A	N/A	All records relating to the implementation of the EMMP shall be kept together such that they can be readily retrieved. These records shall be made available for scrutiny by any relevant authorities on their request.	
5.1.6 Environmental Awareness	N/A	N/A	The Contractor must ensure that all their employees (including all security staff) are trained on environmental considerations, and contents of the EMMP. The contract managers and supervisors will receive an environmental briefing from the ECO, who can also assist with presenting different environmental topics at the toolbox talks. All training and attendance registers must be kept at the site offices.	
5.2 Atlantis Water Resources Management Scheme and Associated Infrastructure Maintenance: Terrestrial Ecology Impact Mitigation Measures				
5.2.1 Maintenance of Drainage Structures				
Repair of damaged water crossing infrastructure: This would include the replacement of broken culverts, redirecting of culverts which are located against the natural flow of a river, dredging inside the watercourse to obtain access to infrastructure, removal of flood debris and silt and the infilling of material for stabilisation and support of new infrastructure.	Loss/damage to vegetation during access and construction.	Low	- Do not pile removed debris and silt onto adjacent vegetation. Either load directly onto a tipper truck or stockpile within a previously disturbed or open area prior to removal. - Only use the required equipment and vehicles to reduce damage/loss of vegetation and minimise erosion. - Avoid unnecessary trampling and damage to vegetation when accessing working areas. - No new access tracks or driving into the veld are permitted during construction, or for maintenance, except where approved by the ECO in consultation with the appropriate authorities and specialists. - Ensure adequate storage (separately) and reinstatement of topsoil. - Monitor the occurrence of weeds following disturbance and ensure removal thereof. Quarterly checks for a	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			period of one year following rehabilitation are recommended.	
Replacement of damaged road and pipeline infrastructure after large storm events: - In most instances after large storm events there is some degree of damage, including erosion of banks, gravel roads and bridge approaches. Some flood debris could also cause damage to the infrastructure itself which would need to be fixed or replaced if damaged extensively. This could entail dredging, excavating and infilling in a stream. Repair of pipeline and cable infrastructure: - Over time, some damage could occur to the installed pipeline, electrical and communication infrastructure, which would result in machinery needing to access the pipe or cables over / underneath the stream and would entail dredging, excavating and potentially infilling inside a watercourse.	Loss/damage to vegetation during access and construction.	Low	Besides efforts to minimise the working width/area in sensitive habitats, it is recommended that the following measures are implemented during maintenance and repair activities: - Search and Rescue of plant material as well as seed collection must be undertaken within the disturbed areas prior to commencement of maintenance activities. Seed collection should be undertaken primarily during the summer months (November to January). Species translocation should occur in early winter when bulbs are visible and still in their active growth phase. The translocation of sods and perennial species should also take place in early winter with the first onset of rain. - All alien vegetation within a band of 50m from the infrastructure route must be cleared prior to the commencement of maintenance activities. This activity is specific to those areas that are currently invaded with alien vegetation and/or plantations. - In cases where trench excavation is required, such must take place in short sections. - A minimum of 500mm of topsoil should be stripped and stored adjacent to the work area prior to the removal of subsoil. - Topsoil must then be returned to the same habitat from which it was removed following the completion of maintenance activities, making sure that bed material and topsoil are not compacted more than they are naturally.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
More than 300 square metres of indigenous vegetation could be cleared for maintenance of below ground infrastructure (e.g., pipelines, powerlines, telemetry, etc.) where the linear infrastructure would need to be excavated and repaired.			• Ensure that the profile of the excavation once top material is returned has the same cross section profile as it had prior to excavation. Thus, any excess material would need to be disposed of elsewhere, so that a raised mound is not created along the pipeline. • Following the return of topsoil, it is important that areas affected by the infrastructure route are rehabilitated as far as possible through replanting of indigenous vegetation within the affected areas. This may include a mix of locally indigenous plants that are functional (to stabilise the habitat) as well as replacement of conservation worthy vegetation. • To mitigate against potential hydrological changes to wetlands and watercourses associated with obstructed flow, it is important that during the maintenance activity, such as replacing a pipeline/powerline, the infrastructure is placed at least 50 cm below ground level (i.e., top material following construction should be at least 50 cm above the top of the pipe) to reduce or minimise changes in the nature of subsurface flows through wetland habitats. • Excavations shall be excavated within the predefined and demarcated working widths/areas in order to repair/maintain the infrastructure as per the construction design drawings and the working area must include sufficient area for the storage of topsoil material. Excavations shall be excavated using an excavator or alternative approved excavation methods. The excavation shall be excavated to the depth specified on the construction drawings and the excavated materials would be stockpiled at designated stockpile areas.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			• The excavated subsoil material must not be mixed with the topsoil material. • Open excavations should be demarcated and checked at regular intervals to ensure no fauna has fallen into them. • No stringing of pipeline outside of the demarcated working area must be allowed. • For repairs of HDPE pipelines, the offcuts and shavings created during HDPE pipeline welding must be collected at the end of each weld and stored in appropriate waste containers to be taken to the site camp at the end of the day. A drop sheet to collect the shavings must be used when welding HDPE pipelines. Care must be taken when using the hot plate to melt the HDPE pipe so as to not cause any harm to people or animals, and to not cause any fires. • If portable generators are used, they must be equipped with drip trays. • Sandbag and concrete collar location/positions may be required based on the freshwater ecologist's recommendations. Once the trench is open, the botanical and aquatic ecologists must refine the location of each collar prior to installation to preserve wet and dry sections along the trench as far as possible. The need for additional collars must be checked with the specialists before pipeline pressure testing. Compaction of the soil will apply to all trenching, however in wetland and stream areas the in-situ material will be replaced without compaction up to a depth of 500mm unless otherwise stated by freshwater ecologist, who will verify	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			this by a walk-through of the site with the contractor/site engineer. - Monitor for weeds and invasive species and remove during regular checks. Quarterly checks for a period of one year following rehabilitation are recommended. <u>In the case of maintenance to both below and above ground crossings, it is recommended that construction be undertaken during the dry season as far as possible when risk of contamination is minimised:</u> - Work areas must be confined to minimise the negative effects of trampling. - Bank rehabilitation would require the input of a restoration botanist / freshwater ecologist.	
5.2.2 Erosion prevention and clearing of sediment				
Replacement and maintenance of erosion control measures: Where erosion control measures are already installed, maintenance would have to be done to ensure these remain in good working order or that areas that are prone to erosion are secured to protect infrastructure and prevent downstream impact to the aquatic ecosystems. This would entail the potential excavation and infilling of	- Localised changes in the runoff that may promote erosion and contaminate these systems through increasing sediment loads into natural systems (particularly during maintenance). - Disturbance of river or wetland habitat during removal of sediment. - Destabilisation of slopes, banks and beds of wetlands and rivers, leading to increased mobility of sediments into sensitive areas.	Low	Erosion is expected to be low given the topography of the area (vegetated dunes and gently undulating to flat sandy areas with dew watercourses and wetlands). Any destabilisation of slopes or riparian areas should be rehabilitated with appropriate erosion control measures and may require re-vegetation.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
material within watercourses or wetlands and activities such as gabion basket installations. Clearing of silt or flood debris from infrastructure (e.g., culverts, weirs and basins) and watercourses: Over time, material such as silt, dead vegetation and litter will accumulate along, under, downstream of and within infrastructure, and in rivers and wetlands. These need to be cleared regularly to ensure proper functioning of the infrastructure and the ecosystems and to prevent flooding and associated damage within these areas. The clearing would entail the dredging or excavating of debris, silt and other flooded material.	Increased sedimentation in sensitive areas, such as wetlands, riparian areas and channels.			
Replacement of eroded stream crossing approaches: Over time some of the gravel road approaches alongside the stream crossings could erode and cause the need for replacement or installation of erosion control measures.	Loss and/or damage to vegetation	Low	Only use required equipment and vehicles to reduce loss of vegetation and minimise erosion.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
This would entail the infilling of material within close proximity of watercourses or within wetlands.				
5.2.3 Vegetation Clearance				
Clearing of alien invasive vegetation from watercourses, weirs and basins: - Large alien invasives will be cleared using chainsaws. Smaller plants will be removed by hand using hand tools to remove the roots from the beds and banks of watercourses. Excavators may be needed to clear alien invasives in areas where access is limited, such as within saturated basins and abstraction ponds above weirs. All plant material will be removed and disposed of at a licenced WDF, with proof thereof retained. - Eradication of undesired vegetation, by either physical or chemical means, including the felling and removal of undesirable/alien trees, shrubs and grass.	- Damage to environment due to use of machinery to remove alien vegetation. - Damage to fauna (may cause death) and flora due to use of diesel-based herbicides. - Poisoning of aquatic systems due to off-target damage to riparian areas from herbicides.	Low This is typically a positive impact provided no damage to natural vegetation or stream embankment occurs during the clearing process. If pile of Invasive Alien Plants (IAPs) are not removed these can cause soil hotspots with fire events.	- It is recommended that all alien trees within a band of 50m from the maintenance footprint be cleared to allow rejuvenation of seed within the topsoil. Where necessary, topsoil and mulch will need to be added and impacted areas revegetated with appropriately specified plants - Prior to the removal of topsoil for excavations, the need to remove or clear all alien vegetation must be assessed and indicated by the freshwater and botanical ecologists or the relevant management authority. If required, the clearance of alien vegetation will be done by a rehabilitation contractor who must remove all alien vegetation within the vicinity of the work areas and control the re-emergence thereof, for the duration of the rehabilitation activities. The removed alien vegetation must be taken off-site and disposed of at licenced WDF, with proof thereof retained. A 50m buffer should be applied around the working area. - Wherever possible, manual methods of alien vegetation removal should be selected instead of using machinery, as this will have far less impact on the environment. Herbicide use may be considered (e.g. for stump treatments where alien trees are cut down by chainsaw) but may only be used if approved in writing by the relevant management authority.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
		Impacts due to herbicides on flora are likely to be Low, while impacts on fauna and freshwater are likely to be more severe.	- Should the use of registered herbicides be the most effective option for control of alien invasive vegetation, as agreed to in terms of an approved Method Statement, then this shall be undertaken in compliance with the terms and conditions of the SANS for handling, storage and disposal of pesticides (SANS 10206:2010, Edition 2.2): i) The use of diesel-based herbicides near watercourses shall not be permitted. ii) Only herbicides registered for the particular plant species requiring control shall be used. Where no herbicide has been registered, the least hazardous herbicide registered for a similar plant species (i.e. another species of tree or shrub or grass) may be used. iii) Herbicide operators mixing and applying herbicides shall be appropriately trained and supervised and shall be equipped with the requisite personal protective clothing in accordance with the SANS requirements and the herbicide labels. iv) Supervisors shall be literate, shall understand the instructions on the herbicide labels, and shall ensure that the necessary safety protocols are implemented. v) The requisite washing facilities and herbicide mixing area shall comply with the SANS requirements, as shall the transport, handling and storage of herbicides. vi) There is a very high risk of off-target damage from herbicides within riparian areas as many herbicides are toxic to aquatic systems, and only herbicides that are approved for use near a watercourse shall be used.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			vii) Herbicides shall not be used in windy or rainy conditions, and care shall be taken to avoid drift onto indigenous plants. - The disposal of alien invasive vegetation by burying or burning is prohibited in terms of national legislation, and shall not occur: - Alien vegetation shall be disposed of at licensed WDF, with proof thereof retained. - Follow-up clearing should take place at least annually.	
Clearing of indigenous vegetation around the borehole sites in case of borehole maintenance or drilling activities: More than 300 square metres of indigenous vegetation could be cleared during redrilling or maintenance activities (e.g., borehole cleaning) at any of the borehole sites for the establishment of drill rigs and/or other equipment.	- Loss of vegetation. - Erosion of areas that are cleared of vegetation cover, or that remain bare during times of heavy rainfall.	Low	- Demarcate working area to prevent unnecessary clearing and damage by machinery. - Only use required equipment and vehicles to reduce loss of vegetation and minimise erosion. - Brush cut vegetation and place topsoil to one side. - Remove species that can be relocated (e.g. succulents, bulbs). - Remove sods and store on site for rehabilitation. - Cover topsoil with shade cloth and do not allow any activity on topsoil stockpiles (vehicle, foot traffic). - Reinstate topsoil after construction. - Stabilise embankments if necessary. - Plant back sods. - Monitor for weeds and invasive species and remove during regular checks. Quarterly checks for a period of one year following rehabilitation are recommended.	
5.2.4 General maintenance activities				
Unsupervised vegetation clearing.	Loss of vegetation	Low	Rehabilitate on a case-by-case basis. Passive rehabilitation is the preferred option for areas with light clearing and seed bank intact.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
• Brush-cutting of firebreaks along pipeline infrastructure. • Repair or replacement of fencing around basins may require clearing of indigenous and/or alien vegetation.				

5.3 Atlantis Water Resources Management Scheme and Associated Infrastructure Maintenance: Aquatic Ecology Impact Mitigation Measures

5.3.1 Maintenance of roads and drainage structures along the road network

Repair of damaged water crossing infrastructure: • Replacement of broken culverts, redirecting of culverts which are located against the natural flow of a river, dredging within the watercourse to obtain access to infrastructure, removal of flood debris and silt and the infilling of material for stabilisation and support of new infrastructure. • Over time some of the gravel road approaches alongside the stream crossings could erode and cause the need for replacement or installation of erosion control measures. This would entail the infilling of material within close proximity of watercourses or within wetlands.	• Destabilisation of slopes, banks and beds of wetlands and rivers, leading to increased mobility of sediments into sensitive areas and possibly gully, head-cut channel (incision) and/or bank erosion. • Increased sedimentation in sensitive areas, such as wetlands, riparian areas and instream channels, thus reducing habitat quality due to smothering of these habitats. • Damage to riparian, instream and/or wetland vegetation when accessing working area and conducting the maintenance activity. • Construction-related water quality impacts such as the leakage of fuels, oils, etc. from construction machinery – this could lead to pollution of the wetlands or rivers.	Minor to Moderate	Various guiding principles should be followed when managing sediments for the AWRMS project. These have been outlined in Section 12 of the Freshwater Report (Appendix C.1) and should be the basis for implementing the below mitigation measures. • Where existing dirt roads need to be regraded (especially within aquatic ecosystems), care should be taken not to grade the road deeper than its natural base level. • Gravel should not be pushed into natural areas during road maintenance. • Road verges must be monitored for alien species, especially grasses. • Road edges to be monitored for concentrated flow paths and erosion during maintenance. • Remove damaged infrastructure that has washed downstream. • Repair work must be done during the dry season (November to April), where possible, when most rivers and wetlands are dry.	
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Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
Replacement of damaged road after large storm events: - In most instances after large storm events there is some degree of damage, including erosion of banks, gravel roads and bridge approaches. Some flood debris could also cause damage to the infrastructure itself which would need to be fixed or replaced (like for like) if damaged extensively. This could entail dredging, excavating and infilling in a stream. Replacement and maintenance of erosion control measures: - Where erosion control measures are already installed, maintenance would have to be done to ensure these remain in good working order or that areas that become prone to erosion are secured to protect infrastructure and prevent downstream impacts to the aquatic ecosystems. This would entail the potential excavation and infilling of	- Introduction of concrete/cement into rivers and wetlands. This can alter the pH of the water, and cause smothering of habitat, fauna and flora. - Introduction of sand for construction which may contain alien plant seeds – which would pose a threat to the biodiversity in the area. - Obstruction or diversion of surface flow during repair work. This could lead to a loss of connectivity within a river or wetland or erosion in an area receiving diverted flow. - Disturbance of aquatic biota resulting in a change in community structure. - Construction footprints and the storage of construction materials may lead to the introduction of invasive alien plant seeds/seedlings, compaction of soils and shading of indigenous plants.		- Wherever possible, concrete or cement must not be mixed on site but rather delivered pre-mixed. If mixing of concrete is needed on site, the mixing area should be located at least 40m away from the edge of any river, riparian area or wetland. - Soils/sand brought onto site should be inspected for seedlings throughout the maintenance project. Seedlings must be removed regularly. - All construction footprints (e.g. construction camps, storage of materials used for repairs, etc.) must be minimised and preferably be located in previously disturbed areas – with sensitive natural areas demarcated along the edge of the buffer (i.e. 40m around rivers and wetlands) as no-go areas. The buffer recommendation only applies as a mitigation measure where aquatic ecosystems will be avoided by the proposed activities. Where work occurs within a river or wetland, then mitigation measures within section 5.3 of this EMMP (this section) apply. - Machinery prone to oil or fuel leakage must be located at least 40m away from the edge of the rivers, riparian areas or wetlands, and the area adequately bunded in order to contain leakages. - All machinery shall have drip trays to contain oil and fuel leaks – these must be cleaned regularly. - Following the completion of the maintenance activity and where construction footprints were established, these areas need to be rehabilitated to the satisfaction of the ECO. This may include ripping compacted soils, removal of contaminated soils (if relevant), revegetation and removal of any invasive alien plant seedlings that may	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
material within watercourses or wetlands and activities such as gabion basket installations. Clearing of silt or flood debris from infrastructure (e.g., culverts, weir and basins) and watercourses: Over time, material such as silt, dead vegetation and litter will accumulate along, under, downstream of, behind and within infrastructure, and in rivers and wetlands. These need to be cleared regularly to ensure proper functioning of the infrastructure and ecosystems and prevent flooding and associated damage within these areas. The clearing would entail the dredging or excavation of debris, silt and other flooded material from the crossings.			have established throughout the period when the maintenance activity took place. - Care must be taken not to damage or destroy any indigenous riparian, instream or wetland vegetation. - Maintenance must be monitored before and after repairs have been done by a suitably qualified Environmental Control Officer (ECO). - Areas where vegetation must be cleared for repair work to occur, or where vegetation has been damaged or destroyed as a result of repair work, must be rehabilitated and re-planted, to the satisfaction of the ECO. - Any repair work (in the form of earthworks) on any of the culverts (for the gabion baskets, concrete aprons or other erosion control measures) should be limited to the road reserve. Once complete, the soils need to be stabilized and replanted with indigenous plants (in consultation with a freshwater or rehabilitation specialist) to prevent the movement of sediments into inland aquatic ecosystems downstream. - Rocks used within the gabion structures should be of a local geology to minimize any potential water quality impairment. - No new access tracks or driving into the veld are permitted during construction, or for maintenance, except where approved by the ECO in consultation with the appropriate authorities and specialists. - Road crossings over inland aquatic ecosystems should be demarcated with headwalls, to ensure that vehicles do not drive over wet areas, causing erosion and habitat degradation.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			• The edges of roads (tracks) to be used for construction purposes are to be clearly delimited with fence poles before construction activities commence. • All roads are to have passing areas clearly demarcated for the duration of the construction activities. • Maintenance activities requiring major earthworks should not commence prior to significant rainfall unless, in emergency scenarios, where critical infrastructure for the operation of the AWRMS is needed. • Once repair work has been completed, any slopes, banks and beds of wetlands and rivers should be stabilised and revegetated according to the mitigation measures set out under in the section below. • When dealing with a channelised or canalised section of a river, or a stormwater drain, sediment can be removed down to the original invert level of the channel. • Sediment removal can only be done during the dry summer months. • Sediment in an unlined natural river or channel should only be removed by hand. • Sediment in a lined river or channel can be removed mechanically, however, only if indigenous riparian vegetation will not be damaged in any way. • Sediment removed from a river channel or canal should be stored in designated areas at least 40m away from any aquatic ecosystems, and used for other purposes relating to the maintenance project such as road construction, filling of eroded areas, etc. where possible. • Sediment should never be removed from a wetland, unless supervised by a freshwater ecologist.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			- During and after the process of sediment clearing, all litter or solid waste must be removed from within a 25m radius of the work site. - The footprint associated with the clearing of culverts should be limited to the road reserve itself and not extend beyond this area. Where this is unavoidable (for whatever reason), the expanded disturbance footprint should be rehabilitated to the satisfaction of the ECO following the disturbance activity to ensure that no negative impacts are experienced further downstream. - Clearing of silt from infiltration and recharge wetlands/basins should be conducted in the dry season (November to April), when these areas are less utilised. Care should be taken not to coincide with periods when biota (e.g. birds) make use of these systems for breeding purposes. Contaminated silt material should be disposed of at a designated and approved waste facility, with proof of disposal retained. Furthermore, silt clearing from these areas should be done with utmost care to prevent unnecessary damage to existing flora and fauna, and be done in a sensible and strategic manner. This should be well planned ahead of time to avoid/minimise disturbance to sensitive areas with input from a freshwater ecologist.	
5.3.2 Management of invasive alien plants and clearance of indigenous vegetation				
Clearing of alien invasive vegetation from watercourses: Large alien invasives will be cleared using chainsaws. Smaller plants will be removed	Damage to bed and banks of rivers and wetlands during vegetation removal. This can lead to erosion and sedimentation downstream.	Minor to Moderate * The clearing of alien invasive vegetation would	Various guiding principles should be followed when managing vegetation for the AWRMS project. These have been outlined in Section 12 of the Freshwater Report (Appendix C.1) and should be the basis for implementing the mitigation measures below.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
by hand using hand tools to remove the roots from the beds and banks of watercourses. Excavators may be needed to clear alien invasives in areas where access is limited, such as within saturated basins and abstraction ponds above weirs. All plant material will be removed and disposed of at a licensed Waste Disposal Facility (WDF), with proof thereof retained. - Eradication of undesired vegetation should be done by either manual or chemical means (not mechanical) and may include the felling and removal of undesirable/alien trees, shrubs, and grass. Clearing of indigenous vegetation around the borehole sites in case of borehole maintenance or redrilling activities: - More than 300 square metres of indigenous vegetation could be cleared during redrilling or maintenance activities (e.g., borehole cleaning) needed at	- Erosion of soil due to removal of stabilising plant cover. This can lead to the deposition of sediment downstream. - Change in temperature regime due to removal of shade. - Obstructions to flow caused by removed biomass being placed in the river or wetland and resulting in a change in hydrological regime and/or erosion. - Disturbance of aquatic biota. - Water quality impacts relating to borehole cleaning could lead to pollution of the wetlands or rivers.	have a positive impact on the environment, but the potential negative impact could arise if the mitigation measures are not strictly applied during alien clearing activities.	<u>Vegetation clearing</u> - Removal of problematic wetland, riparian or instream vegetation must be done by hand, in order to minimise damage to the banks and bed of the river channels and wetland habitats. - Only herbicides that are appropriate for use close to inland aquatic ecosystems can be used (e.g. Focus Ultra). This must be done with great care and adherence to the recommended application protocols. Herbicides containing glyphosates may not be used in close proximity to wetlands or rivers (e.g. RoundUp). Furthermore, chemical application should be avoided on windy days and before heavy rains. The storage and handling procedures specified by the manufacturer of the chemical must be followed. - Clearing of vegetation must be done during mid- to late summer/autumn (December – April), when most river channels and wetlands are dry. - Cleared vegetation (biomass) must be removed from the cleared areas, and preferably chipped for use as mulch, or burned. - Indigenous vegetation in rivers and wetlands that have a PES of B and above should not be removed without the approval of a freshwater ecologist. - All alien plant species should be removed in a radius of 25m (within the road reserve) of all culverts, drains and rivers. - A maximum width of 5m of vegetation around the culvert can be removed in instances where access to the culvert is required for maintenance. In areas where sensitive terrestrial vegetation occurs, guidance should be	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
any boreholes sites for the establishment of drill rigs and/or other equipment.			requested from the botanist in terms of whether search and rescue efforts will be required. • Wherever possible and where vegetation growth is not a direct problem for surface water flow, cleared areas should be replanted with appropriate indigenous species. This is recommended where cleared areas exceed approximately 25m², or where cleared areas are at risk of erosion. • Vegetation clearing efforts must take cognizance of when biota (e.g. birds) make use of these systems for breeding purposes and should preferably be done outside these periods. • Cleared areas must regularly be checked for invasive alien plants (IAPs) and these must be removed. <u>Replanting</u> • Mulch must be used in all areas where re-planting is to take place. The following shall apply: i) All mulch shall be free of alien species. ii) Any vegetative material shall be reduced either by mechanical means (chipper) or by hand-axing to sticks no longer than 100mm. iii) Compost from a local source can also be utilised as mulch during replanting and rehabilitation of the inland aquatic ecosystem. The compost shall be well decayed, friable and free from weed seeds. iv) Wood chips (including bark), which are half composted and have not been treated with preservatives can also be utilised as mulch during replanting of the site.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			v) The chips shall be no longer than 50mm in length or breadth. • Sods of plants such as sedges, rushes and grasses are the best means of planting. These will need to be sourced early from local nurseries, as these are sometimes difficult to obtain. • Plants should be placed in clumps rather than evenly spaced, as this allows some protection of smaller plants by the larger individuals and appears more natural. This also facilitates more effective irrigation. • Unless proper nursery conditions are created on site, plants must not be stored for longer than 10 days on site prior to planting. • Planting shall be done by a skilled team. • The planted areas shall be monitored for erosion during the first winter, and areas that are subject to erosion shall be stabilised. • No fertilisers shall be used, as these could have a negative impact on the relatively nutrient-poor soils of the area and thus on the associated vegetation, and also on the water quality within rivers/wetlands. • The planted areas shall be irrigated for the first year after planting (i.e. the duration of the establishment maintenance period), when appropriate, and longer if conditions are dry. Watering to a depth of at least 100 mm should be repeated at least twice a week, before 10am or after 6 pm. • No equipment, vehicles or unauthorised personnel shall be allowed onto areas that have been planted. Only	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			persons or equipment required for the preparation of areas shall be allowed to work in these areas. <u>Erosion control</u> • Additional erosion control measures can be put in place, where there is a risk of soil erosion occurring after clearing (or other maintenance activities). The ideal longitudinal slope to prevent erosion in a river channel is 1:7 (roughly 14%), while laterally the banks should in general not be steeper than 1:3 (roughly 33%). • Stabilisation materials include: i) Ecologs (dry woody material or sand contained in a hessian and chicken wire roll, see Figure 5.2 on p.90 in the Freshwater Report (Appendix C.1)). ii) Biodegradable netting/matting. iii) Geotextile matting of thick filaments designed to be secured over a vulnerable slope to prevent surface erosion (see Figure 5.2 on p.90 in the Freshwater Report (Appendix C.1)). iv) Rock packing. v) Mulch stabilisation. vi) Compost stabilisation. <u>Recommended plant species</u> Table 5.7 on p. 91 in the Freshwater Report (Appendix C.1) provides a list of plant species that have been impacted by clearing IAPs or impacted through the implementation of the and thus require revegetation. In areas that are dominated by terrestrial plant species, indigenous plant	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			species, as outlined in the Botanical Report (Appendix D.1), should be replanted.	
5.3.3 Maintenance of above and below-ground pipelines/powerlines				
Replacement of damaged pipeline infrastructure after large storm events: - In most instances, after large storm events, there is some degree of damage, including erosion of banks, gravel roads and bridge approaches. Some flood debris could also cause damage to the infrastructure itself which would need to be fixed or replaced (like for like) if damaged extensively. This could entail dredging, excavation and infilling in a stream. Repair of pipeline and cable infrastructure: - Over time some damage could occur to the installed pipeline, electrical and communication infrastructure, which would result in machinery needing to access the pipe or cables over / underneath a wetland or river and would entail dredging, excavating and potentially	- Destabilisation of slopes, banks and beds of wetlands and rivers, leading to increased mobility of sediments into sensitive areas and possibly gully, head-cut channel (incision) and/or bank erosion. - Increased sedimentation in sensitive areas, such as wetlands, riparian areas and instream channels, thus reducing habitat quality due to smothering of these habitats. - Damage to riparian, instream and/or wetland vegetation when accessing working area and conducting the maintenance activity (e.g. brush-cutting of vegetation along the transmission corridors for maintenance or hauling cables through sensitive habitats). - Trampling and general disturbance of natural habitat and biota as cabling is hauled by foot through sensitive habitats or vehicular activity required to transport cabling and other	Moderate	<u>General construction footprint-related mitigations (where there is a need to establish on site)</u> - All construction footprints (e.g. construction camps, storage of materials used for repairs, etc.) must be minimised and preferably be located in previously disturbed areas – with sensitive natural areas demarcated along the edge of the buffer (i.e. 40m around rivers and wetlands) as no-go areas. - Following the completion of the maintenance activity and where construction footprints were established, these areas need to be rehabilitated to the satisfaction of the ECO. This may include ripping compacted soils, removal of contaminated soils (if relevant), revegetation and removal of any invasive alien plant seedlings that may have established throughout the period when the maintenance activity took place. - During and after the process of establishing a construction camp, all litter or solid waste must be removed from within a 5m radius of the work site. The area should also be inspected for invasive alien plants – details for clearing are provided in Section 5.3.2. - Wherever possible, concrete or cement must not be mixed on site but rather delivered pre-mixed. If mixing of concrete is needed on site, the mixing area should be located at least 40m away from the edge of any river, riparian area or wetland.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
infilling inside a wetland or river. More than 300 square metres of indigenous vegetation could be cleared for maintenance of below ground linear infrastructure (e.g. pipelines, powerlines, telemetry etc.) where the linear infrastructure would need to be excavated and repaired.	construction-related material. This may result in a change in community structure. • Construction-related water quality impacts such as the leakage of fuels, oils, etc. from construction machinery – this could lead to pollution of the wetlands or rivers. • Introduction of concrete/cement into rivers and wetlands. This can alter the pH of the water, and cause smothering of habitat, fauna and flora. • Introduction of sand for construction which may contain alien plant seeds – this would pose a threat to the biodiversity in the area. • Obstruction or diversion of surface flow during repair work. This could lead to a loss of connectivity within a river/wetland or erosion in an area receiving diverted flow. • Poor water quality entering the receiving environment along pipelines that cannot be shut off during maintenance. This will cause pollution of rivers and wetlands. • Construction footprints and the storage of construction materials		• Machinery prone to oil or fuel leakage must be located at least 40m away from the edge of the rivers, riparian areas or wetlands, and the area adequately bunded in order to contain leakages. • All machinery shall have drip trays to contain oil and fuel leaks – these must be cleaned regularly. • Suitable toilet and wash facilities must be provided to avoid the use of sensitive areas for these activities. These service areas must be maintained, and toilets emptied on at least a weekly basis. • All solid waste must be removed from site on a weekly basis. <u>Replacement of above and/or below-ground infrastructure</u> • The width of the construction footprint must not exceed the total working widths which are the current road width + 4 m work area + 2 m topsoil windrow, with strategically placed bypasses approximately every 200 m – 300 m. • Trench excavation for maintenance purposes should take place in short sections – 50 m per working front is recommended, or at least the minimum length required for laying of relevant services. • Opened trenches must be filled as quickly as possible after trenching is initiated. This is to minimise the period in which the disturbed areas are open and destabilised. No trenches must be opened within three days of predicted heavy rainfall. • The minimum bucket-size for excavators, required to achieve the minimum trench width as per the SANS 1200 DB specifications, must be used at all times, to avoid	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	may lead to the introduction of invasive alien plant seeds/seedlings, compaction of soils and shading of indigenous plants.		encroachment of the trench beyond the desired working width, and excavation of a wider trench that faces the risk of bank slumping. • Trenching through areas likely to collapse, such as through deeper sandy areas, must have the sides battened or shored to prevent collapsing taking place. • Search and Rescue of plant material as well as seed collection must be undertaken within the disturbed areas starting preferably a year prior to commencement of construction activities to include all seasonal biotic cycles – especially during spring time for seed/geophyte collection. This may be more important in certain portions of the AWRMS where known species of conservation concern have already been identified by a botanist (see Appendix D.1). • No areas are to be cleared of vegetation cover unless clearly specified individual time intervals are agreed to, which is intended to allow sufficient time to collect/rescue plant material and to limit potential erosion of cleared (devegetated) surfaces. At least a year's notice, but at minimum 3 months to rescue plants is necessary. • All alien vegetation within a band of 50 m (i.e. 25 m on each side) from the pipeline route must be cleared prior to trench excavation. • To mitigate against potential hydrological changes to wetlands, it is important that the pipeline be adequately covered to minimise its negative effects (at a depth of at least 1 m). The ideal depth for the pipe depends on the nature of the wetland. For instance, the pipe should be placed below the impermeable layer lying below perched wetlands, and soils compacted above the pipe to	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			simulate this impermeable layer. For wetlands on deeper soils, especially those fed by groundwater, soils should not be compacted above the pipe, to reduce impacts on sub-surface flows. Generally, the perched nature of a wetland can only be determined once the trench has been excavated – thus it is essential that the depth and covering of the pipe be determined on site by the specialist team, section by section. • To avoid the trenches or above-ground pipelines becoming drainage channels through wetlands and slopes, the wetland on all sides must be protected by “collars” (either made from compacted excavated material or sandbags with geotextile lining). The collars in the trenches must be installed from underneath the pipes to near surface level and must be filled with sand/cement/concrete so that the whole section of the trench is made relatively impermeable to flows along the length of the trench. • Dewatering of trenches must be done when necessary but should not lead to quantities of silt-laden water entering the environment. Reducing the length of time trenches remain open will reduce this likelihood. Shoring of side walls of trenches greater than 1.5m depth will be necessary to prevent the sides from collapsing when waterlogged. • Discharge of dewatered quantities should be dissipated carefully within a disturbed area of a wetlands or rivers catchment in a manner that does not cause detrimental harm or erosion to the receiving environment (i.e. smothering of habitat from sediment-laden waters). This can be achieved by pumping sediment-laden water into	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			a pond/sump situated 40m away from the river/wetland to allow for the settling of these sediments prior to that water being discharged back into the environment. • All topsoil must be removed and placed in windrows adjacent to the trench prior to the commencement of construction. Care must be taken to ensure that removed topsoil does not fall into the trench from adjacent windrows, especially where gradients are steep. In some cases, it may be necessary to store topsoil at a nearby stockpile site to avoid this. • Topsoil is to be protected with dense hessian sheets and must be separated from construction activities by plastic sheeting. The hessian sheets covering the topsoil must be held in place by stakes, large rocks (which may not be sourced from rivers) or similar to hold it in place through strong windy conditions. Note that plastic sheeting must be used to protect the topsoil from contamination from any infrastructure being repaired that may cause pollution of the surrounding environment. • Topsoil shall be stored for the shortest possible time. • No topsoil replacement (return) is allowed during the period September to November, regardless of site sensitivity. This is an embargo period to reduce erosion as any seedling regrowth in the returned soil must be given a suitable duration to establish so that they can survive the following dry summer without watering. • Top material must then be returned to the same habitat from which it was removed following pipe laying, making sure that bed material and topsoil are not compacted more than they are naturally.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			• Ensure that the profile of the trench once top material is returned has the same cross section profile (within 100 mm) as it was prior to trench excavation. Thus, any excess material would need to be disposed of elsewhere, so that a raised mound is not created along the pipeline. Raising the filled area above natural ground level, in most instances, interferes with the natural flow of water by creating a barrier in the topography. The returned topsoil must be landscaped, planted and seeded so that the area functions in a natural way. Meaningful subsidence should not occur where the returned subsoil is suitably compacted at the 0.5 m level prior to the return of the topsoil (except under specified conditions). Slight subsidence can benefit the return of plants by creating a moister environment, as long as it does not cause channelling down the trench. • Following the return of top material, it is important that areas affected by the infrastructure route are rehabilitated as far as possible through replanting of indigenous vegetation within the affected areas. This may include a mix of locally indigenous plants that are functional (to stabilise the habitat) as well as replacement of conservation-worthy vegetation. • No rehabilitation activities, such as topsoil return and sowing in drylands, are to be done from September to November. • No interval between return of topsoil and the sowing of seed is to take place. Aqueous smoke solution of suitable concentration must be applied to the sown surface to stimulate germination.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			• Sandbags filled with local weed-free sand are to be used to berm off devegetated / bare construction areas such as stored or spoil materials. • Where existing stormwater pipes carry water under a track or road, the pipe must be replaced if broken and extended to discharge water beyond the adjacent trench. • Rock for the filling of gabions for the above-ground sections of pipeline may not be sourced from rivers. • The final design for above-ground pipes must take into account the need to allow for surface flow of water within wetlands and rivers. • Gaps in gabions protecting above-ground pipes must be placed to allow for the movement of fauna. • Maintenance activities requiring major earthworks should not commence prior to significant rainfall unless, in emergency scenarios, where critical infrastructure for the operation of the AWRMS is needed. • Rolling out of cables should avoid sensitive aquatic ecosystems and take place in disturbed areas that are utilised as part of the maintenance activities. • For those pipelines that cannot be shut off during maintenance, the continual flow of poor water quality into the receiving environment will need to be managed. More specifically, where continual discharge from these pipelines will occur during maintenance activities (which will likely only occur along pipeline routes in close proximity to Basin 6, Basin 7 or Coastal Recharge Basins), temporary pipelines (with pumps) should be laid within the road reserve (or in disturbed areas) that discharge the water from the damaged pipeline directly into the closest of these basins. These three areas	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			typically contain large bodies of standing water and thus are large enough to offer dilution. <u>Temporary pipelines</u> • Temporary pipelines carrying discharge water from dewatering during trenching must be laid down in previously disturbed areas, such as existing roads and tracks. • During dewatering of trenches during replacement of major pipelines, pipes should be monitored for leaks, to avoid large volumes of water flowing in or across roads, causing erosion. <u>Stockpiles</u> • Areas designated for stockpiles must be placed well away from sensitive habitats, and at least 40m away from any wetland or river. • Sufficient space must always be designated to allow for truck turning, loading and off-loading, so that vehicles will not drive into the natural areas. • All the sites require pre-utilization control of the alien species present on them and in a buffer 25 m wide around the sites. Control activities must be introduced timeously so that any regrowth of their seed is stimulated for control prior to stockpiling taking place at them. These preparatory controls are usually required before the preceding winter begins to eliminate the addition of new seed to the stockpile area from the surrounds and to cause the seed already present in the soil to germinate in the disturbed areas with the onset of the wet winter conditions.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			• All the sites that are used will need the top materials present on them stored for rehabilitation purposes. These materials will need to be covered using at least 60% shade cloth. Note that hessian cover, if used, needs to be strong and dense and able to function through environmental rigours for extended periods, as the stockpile areas will be utilized for the duration of the construction activities. • The bermed top materials can form a boundary to the sites. A subsoil berm must be placed along the inner boundary of the topsoil berm, to protect the topsoil. • Natural wash or flow of surface water leading onto the stockpile site must be diverted away from the stockpile site, with input from a freshwater ecologist and / or botanist. Wash or flow from the stockpile sites will need to be contained. Sandbags should be used to prevent erosion of stockpiled materials into the surrounding environment. • The perimeters of the construction stockpile and storage areas will need to be adequately demarcated to avoid ingress into the surrounding veld. <u>Pipeline/cable infrastructure over river crossings</u> The following mitigation measures apply to all river crossings (for infrastructure through wetlands, the mitigation proposed within this section outlining "Replacement of above and/or below-ground infrastructure" should be followed): • Mitigation of short-term, construction-related damage to the river / vegetation must be guided by clear method statements.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			• Work in rivers (i.e. within the active channel) should, as far as possible, take place during the dry season (November to April). • A larger pipe diameter will allow for a wider span across the river. This could be achieved, even if the smaller diameter pipe must be placed within a wider pipe. • The exact position of the plinths and of their construction excavations and of the work areas need to be pegged exactly. • The wetted banks of the rivers (i.e. the part of the bank that is in contact with water) must not be damaged during construction except as approved by the relevant specialist. • For below-ground crossings, the pipe must be placed such that cover material is returned to the natural level of the channel so that natural flow paths are not altered. • The disturbed area must be revegetated to ensure re-establishment and stabilisation of slopes. • No concrete is to be used within the active channel without suitable berms to contain polluted water. This polluted water is to be removed off-site to an approved waste dumping area. • Concrete and cement must be contained as far as possible away from the active channel. • Any disturbance to the riparian areas of rivers must be rehabilitated through stabilisation and revegetation of the channel banks with appropriate species. • The area required for construction must be minimised to avoid the negative effects of trampling, damage to vegetation and soil compaction.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			- Bank rehabilitation would require the input of a restoration botanist / freshwater ecologist. - The pipes need to be painted a colour agreed upon that will blend into the surrounding environment. - Maintenance activities requiring major earthworks should not commence prior to significant rainfall unless, in emergency scenarios, where critical infrastructure for the operation of the AWRMS is needed.	
5.3.4 Maintenance of existing boreholes				
Re-drilling, cleaning and maintenance of existing boreholes (not any new ones): Maintenance of boreholes (production and monitoring) will be required from time to time and would include activities such as borehole cleaning, redrilling, pump testing and casing maintenance.	- Water quality-related impacts associated with borehole maintenance activities resulting in uncontrolled effluent, contaminants, spillages and artesian conditions entering aquatic ecosystems. - Destabilisation of slopes, banks and beds of wetlands and rivers, leading to increased mobility of sediments into sensitive areas and possibly gully, head-cut channel (incision) and/or back erosion. - Increased sedimentation in sensitive areas, such as wetlands, riparian areas and instream channels, thus reducing habitat quality due to smothering of these habitats. - Damage to riparian, instream and/or wetland vegetation when	Moderate	- Construction-related mitigation measures, as outlined within Section 5.3.1, are applicable for any maintenance-related activities of existing boreholes. - Effluent arising from existing borehole drilling, cleaning or maintenance may not be discharged into any inland aquatic ecosystems. - Storage of any machinery and materials required for borehole maintenance must remain within disturbed areas outside the 40m buffer around each aquatic ecosystem. - Within the redrilling footprint itself, all sump material must be returned to the sump pits with top material used for final shaping as part of the rehabilitation process. Where necessary, topsoil and mulch will need to be added and impacted areas revegetated with appropriately specified plants. - For borehole maintenance of any existing boreholes (monitoring and production), most of which are located within sensitive environments (i.e. within nature reserves), on site contaminants and spillages can be contained to a large extent prior to them entering the	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	accessing working area and conducting the borehole maintenance activity. • Trampling and general disturbance of natural habitat and biota may occur when pipes to direct drilling effluent are hauled by foot through sensitive habitats or when vehicular activity is required to transport pipes and other construction-related material. This may result in a change in community structure. • Construction-related water quality impacts such as the leakage of fuels, oils, etc. from borehole maintenance machinery – this could lead to pollution of the wetlands or rivers. • Introduction of concrete/cement into rivers and wetlands. This can alter the pH of the water, and cause smothering of habitat, fauna and flora. • Obstruction or diversion of surface flow during repair work. This could lead to a loss of connectivity within a river/wetland or erosion in an area receiving diverted flow. • Borehole maintenance footprints and the storage of required		surrounding environment by lining the floor of each site within the contained area with heavy duty plastic sheeting. This sheeting should lead runoff into one or more sumps at the lowest end(s) of the drill site. Captured runoff must be pumped into containers for eventual removal off-site, thus reducing the wash of effluents or environmental contaminants on the ground into the surroundings. This would improve the post-drilling clearing up of the drill site. For borehole maintenance of any existing boreholes (monitoring and production) within less sensitive environments (i.e. within in and around the town of Atlantis and the Wesfleur WWTW), every effort should still be undertaken to contain contaminants and spillages via sumps before discharging into an artificial recharge basin (if nearby) or into very disturbed/degraded terrestrial habitats (away from any inland aquatic ecosystems). This should be guided by a suitable specialist. • The impacts associated with the “blow” of drilling effluent can be somewhat minimized by the use of a rubber ‘sleeve’ surrounding the drill bit such that the extent of the material spread from the borehole is reduced. While the impacts of drilling effluent spilling into sensitive habitats can be reduced by the use of sumps during redrilling and pump testing, together with plastic lined trenches and/or pipes that direct effluent directly to a recharge basin (if nearby) or points approved by the Nature Reserves’ management (away from inland aquatic ecosystems), there are still instances where flows of effluent cannot be effectively contained and thus still pose a risk of contamination to ecologically sensitive	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	materials may lead to the introduction of invasive alien plant seeds/seedlings, compaction of soils and shading of indigenous plants.		habitats. In instances where spillage into watercourses or wetlands does occur, it is recommended that the extent of the impact is measured in terms of water quality, aquatic fauna and flora and geomorphological (habitat) changes. It is further recommended that remediation measures (e.g. the removal of sediments) under the guidance of a specialist be implemented and that the recovery of the system following the event is monitored. • Should artesian conditions exist during borehole maintenance, it is imperative that a system be set up to contain artesian flows. Depending on the rate of flow, this could involve setting up a temporary flexible pipe that can carry groundwater to holding tanks and transported offsite for discharge elsewhere. • Topsoil is to be protected with dense hessian sheets and must be separated from construction/redrilling/borehole maintenance activities by plastic sheeting. The hessian sheets covering the topsoil must be held in place by stakes, large rocks (which may not be sourced from rivers) or similar to hold it in place through strong windy conditions. Note that plastic sheeting must be used to protect the topsoil from contamination from any infrastructure being repaired that may cause pollution of the surrounding environment. • Topsoil shall be stored for the shortest possible time. • No topsoil replacement (return) is allowed during the period September to November, regardless of site sensitivity. This is an embargo period to reduce erosion as any seedling regrowth in the returned soil must be	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			given a suitable duration to establish so that they can survive the following dry summer without watering. Following the return of top material, it is important that areas affected by the infrastructure route are rehabilitated as far as possible through replanting of indigenous vegetation within the affected areas. This may include a mix of locally indigenous plants that are functional (to stabilise the habitat) as well as replacement of conservation-worthy vegetation. No rehabilitation activities, such as topsoil return and sowing in drylands, are to be done from September to November. More details around appropriate rehabilitation (in terms of soil stabilisation and revegetation) are provided in Section 5.3.2.	
5.4 Clearing of a pond at the Silwerstroom Filtration Works for abstraction purposes (abstracted from existing Silwerstroom MMP)				
5.4.1 Clearing of sediment, organic matter and plant growth				
- An approximate 130m shall be cleared around the pond, based on an approximate clearing width of 10m using a purpose made excavator that has a reach of approximately 10m. - The excavated organic matter and reeds shall be stockpiled on the existing gravel parking area of the Siwerstroom Water Works, before being loaded onto tip trucks for further disposal (the CCT shall consider disposing the material at a garden waste facility).	- Increased sedimentation in sensitive areas, such as wetlands, riparian areas and instream channels, thus reducing habitat quality due to smothering of these habitats. - Damage to riparian, instream and/or wetland vegetation when accessing working area and conducting the maintenance activity. - Destabilisation of slopes, banks and beds of wetlands and rivers, leading to increased mobility of	Medium	- A purpose-made excavator with an estimated reach of 10m shall be used for clearing activities. - Excavation activities shall be performed during the drier summer months to prevent possible erosion and siltation caused by rainfall runoff over exposed areas. - Silt traps shall be installed below the weir during excavation activities to prevent siltation of the system downstream. - Movement of the excavator and haul trucks within the wetland areas shall be kept to a minimum and remain on the weir wall as far as possible. - The construction vehicles (tipper trucks) should be restricted, as far as possible, from entering the wetland area and should remain on the gravel access road.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	sediments into sensitive areas and possibly gully, head-cut channel (incision) and/or bank erosion. • Disturbance of aquatic biota resulting in a change in community structure. • Obstruction or diversion of surface flow during repair work. This could lead to a loss of connectivity within a river or wetland or erosion in an area receiving diverted flow. • Trampling and general disturbance of natural habitat and biota.		• Excavation of decayed material from the pond bed and vegetation removal shall be limited to the specified site and should not encroach into the wetland areas above and below the weir. • The surrounding river banks shall not be excavated during clearing activities. • The maximum excavation depth shall be determined by the absence of decayed organic material in the bucket once removed. A competent person shall be present to monitor that excavation of bed material does not proceed beyond the defined depth. • All plant material, excavated silt, and organic material shall be covered with a tarpaulin during transportation. • The cleared material shall not be stockpiled in the wetland buffer zone. • No run-off from stockpiles shall be allowed to flow directly into the Silwerstroom. Any run-off shall be contained and disposed of off-site. • Refueling shall take place on the existing gravel parking area, away from the Silwerstroom. • A chemical toilet shall be placed on a previously disturbed surface away from the Silwerstroom for the duration of the clearing activities. • On completion of excavations, all disturbed areas around the pond shall be manually raked over and loosened to allow regrowth of the vegetation. <u>Alien vegetation management:</u> • Alien vegetation that is beyond the reach of the excavator shall be cleared manually. • Any alien seedlings or saplings encountered around the pond shall be removed by hand and appropriate PPE	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			shall be worn. Trees up to 2m tall shall be removed by digging out or hoeing and large mature trees shall be removed by cutting the stem below the ground level and stumps shall be treated with appropriate herbicide directly on the stump. Only herbicides approved by DWS shall be used and care shall be taken with the choice of herbicide to ensure no additional impacts on the wetland areas or indigenous vegetation occurs due to the herbicide used. Herbicides shall not be used on windy or rainy days.	
5.5 Clearing of vegetation and sediment at the Donkergat River Diversion Pipeline outlet (abstracted from the MMP for the outlet of the Donkergat Diversion Pipeline)				
5.5.1 Clearing of sediment, organic matter and plant growth				
- Such clearance will take place three metres behind, next to and ahead of the outlet structure. Sediment will be removed to the base of the structure to allow laminar discharge of water into the watercourse. - An area of 300m² will be cleared of vegetation. Vegetation clearance will occur around the outlet structure and between the outlet structure and the manhole. - A maximum volume of 20m³ of sediment will be removed around the outlet structure and	Clearing of sediment and vegetation around the outlet and towards the upgradient manhole could result in impacts on the ecosystem of the watercourse.	Medium to low	- The excavation activities shall be performed during the dry summer season in order to prevent possible erosion and siltation caused by river flow. - Ensure that siltation of the system downstream is prevented by installing silt traps/rills below the outlet works during the excavation activities. - Movement of the excavation machinery and haul trucks shall be kept to a minimum and remain outside of the river embankment and watercourse as far as possible. - Excavation of material and vegetation removal shall be limited to the specified site and not encroach into other portions of the watercourse. - The surrounding riverbanks shall not be excavated during clearing activities since it will lead to increased topographic and geomorphological alteration of the system.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
3m down toward the watercourse if repairs to the pipe between the manhole and outlet structure are needed. A backhoe excavator will be used for the clearing activity.			- The maximum excavation depth shall be determined by the base of the outlet works. There shall be a competent person monitoring the removal process to ensure that the excavation of material does not proceed beyond the defined depth. - The cleared material from the specified site shall not be stockpiled near the watercourse, but shall be removed off site immediately. - All plant material, excavated silt and organic matter shall be covered with a tarpaulin fixed to the vehicle during transportation by road to prevent any blow-off from the vehicle. - The CCT shall consider disposing the material at a garden waste facility instead of at a municipal landfill. - Refueling shall take place at the Witzands Water Treatment Works, away from the Donkergat River. - A chemical toilet shall be placed on a previously disturbed surface at least 50m away from the river. - On completion of excavations, all disturbed shall be rehabilitated to the satisfaction of the ECO. Rehabilitation may include scarifying compacted areas, infilling any depressions with topsoil suitably sourced from the area, etc. - All staff are to be informed of the relevant evacuation requirements in the event of an evacuation, as the site falls within the Urgent Protective Action Zone of the Koeberg Power Station.	
5.6 Generic Mitigation Measures				
5.6.1 Site Access	Destruction of or damage to vegetation and soils as a result of	Low to High	Access to the portion of the Witzands wellfield within Koeberg Nature Reserve is via the Koeberg Nuclear	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	vehicles driving through sensitive areas. Erosion and sedimentation through creation of preferential flow pathways and concentration of surface flows along tracks		Power Station's access gate, off the R27. Access control is managed by Eskom. - Access to the portion of the Witzands wellfield within the Witzands Aquifer Nature Reserve is off Dassenberg Drive. Access is controlled by the CCT. - Access to the Silwerstroom wellfield is via Silverstream Road off the R27. Access is managed by Cape Nature. - It must be considered whether overnight/24-hour security is required.	
5.6.2 Site Camp	- Trampling of vegetation and soil as a result of movement of workers through sensitive areas. - Disturbance of flora and fauna through noise and light pollution during working hours. - Destruction of or damage to vegetation through fire. - Erosion and sedimentation through creation of preferential flow pathways and concentration of surface flows along pedestrian pathways. - Site camp footprints and the storage of construction materials may lead to the introduction of invasive alien plant seeds/seedlings, compaction of soils and indigenous plants. - Introduction of sand for construction which may contain alien plant seeds – which would	Low to High	- The location of the Contractor's main site camp must be approved by the relevant management authorities, landowners and the ECO and will form part of the method statement. - All emergency numbers and the site safety officer's name and telephone numbers will be prominently displayed within the camp site. In addition, posters with environmental "do's and don'ts" will also be displayed. - There will be adequate fire extinguishers within the site camp to deal with fires. Litter bins will be provided and placed at the site office and designated smoking/eating areas. These bins will be lockable to prevent animals from accessing the bins. - All tools and equipment will be stored in the storage container at the site camp. The site camp will be fenced off with fencing panels and all relevant signage displayed. - Following completion of construction activities, the site camp area must be left in the state in which it was found.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	pose a threat to the biodiversity in the area.			
5.6.3 Eating Areas	Litter entering sensitive areas.	Low	- Provision shall be made for employee facilities including for shelter and eating areas, which must be kept clean and hygienic. - Bins shall be provided in demarcated eating areas and emptied on a regular basis (e.g., weekly) to avoid attracting small mammals and rodents, and causing nuisance conditions. - Drinking water facilities shall be provided. - No fires shall be allowed anywhere on site or at the site camp, although gas cookers may be used at a safe location within the site camp.	
5.6.4 Site Demarcation and Access Roads	- Destruction of or damage to vegetation and soils as a result of vehicles driving through sensitive areas. - Erosion and sedimentation through creation of preferential	Low to High	As far as possible, existing roads shall be used for access/haulage purposes. Any new roads shall be planned in advance of any planned works and shall be approved by the ECO and the relevant management authority. Planning shall the proposed route, size/type of disturbance, and type of vehicles and machinery that will use the access. Any temporary access roads required	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	flow pathways and concentration of surface flows along tracks.		will be constructed with adequate drainage measures to allow for storm water to drain away from the road without causing erosion. • All working areas shall be clearly demarcated with no traffic, access, walking and trampling outside these areas. No walking or driving through the natural veld, rivers or wetlands is allowed. Access roads must be kept in good condition using coarse fill where necessary (fill material shall be approved by the relevant management authority). • No construction/rehabilitation materials are to be stockpiled outside of the demarcated working areas or outside of the temporary stockpile areas. The Contractor shall maintain in good order all demarcation fencing and barriers for the duration of construction activities, or as otherwise instructed.	
5.6.5 Traffic Management	Destruction of vegetation and compaction of soils in sensitive areas where vehicles drive off the roads or create wide turning circles.	Low to Medium	• All traffic accommodation shall be in accordance with the South African Roads and Traffic Signs Manual. • Care and planning shall be taken to ensure minimum traffic disruption. • Appropriate traffic warning signs and flagmen shall be placed when required. • All construction vehicles shall be in a road-worthy condition and shall always maintain traffic safety. • Existing tar and gravel roads shall be used for construction and operational vehicle movement, with speed limits adhered to. • If access roads are going to be blocked because of the works all other local road using organisations (other contractors, local authority, etc.) shall be notified with arrangements such as detours made to accommodate	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			the other road users. Flag persons shall be used where necessary to indicate access control areas and alternative routes. The Contractor shall ensure that all material is secured or covered, as required, to ensure safe passage between destinations and prevent any material from leaving vehicles during transportation. This includes cleaning off loose debris and mud from vehicles prior to leaving sites.	
5.6.6 Passing Areas and Turning Areas	Destruction of vegetation and compaction of soils in sensitive areas where vehicles drive off the roads or create wide turning circles.	Low	Passing areas and turning areas may be constructed, if required. Where these fall outside of the planned working areas, such must be approved by the ECO and relevant management authority, in consultation with a botanist or rehabilitation contractor, if necessary.	
5.6.7 Protection of Fauna and Flora	- Drowning of fauna falling into containers or accumulations of surface water. - Poor recovery - Changes to plant community structure - Loss of biodiversity - Undesirable weeds	Low to High	- Brush cutting shall be considered as an alternative to vegetation clearance, wherever feasible. - Clearance of vegetation shall only be undertaken following approval by the ECO and the relevant management authority. - Prior to vegetation clearance, the need for Search and Rescue shall be assessed by the ECO, and if necessary, a botanist and/or rehabilitation contractor. - A visual inspection shall be done prior to machinery working in an area, and should any fauna be present within close proximity to the working area, such should be encouraged to move away from the area, for example, by means of noisy gestures, and no fauna should be harmed in the process.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			- Should any snakes or poisonous / dangerous animals be found inside the working areas, the ECO should be contacted to advise on correct removal procedures. - The hunting of animals is prohibited, including the use of traps and snares.	
5.6.8 Plant Search and Rescue and Rehabilitation	- Poor recovery - Changes to plant community structure - Loss of biodiversity - Undesirable weeds	If implemented properly success is generally good and thus impacts Medium or even Low	- In the event that indigenous vegetation is identified, the ECO (in consultation with the CCT Management Branch and a botanist/ ecologist, if necessary), shall assess if Search and Rescue (S&R) is required. If so, such shall be undertaken prior to any disturbance to that area. - An S&R (Rehabilitation) contractor shall be appointed to undertake the S&R for all areas where such is required. Alternatively, such may be undertaken or overseen by the relevant management authority. - The Rehabilitation Contractor shall be responsible for storing any rescued seed and plants/plant material (e.g., at a nursery), and overseeing the clearance of topsoil, with the primary focus being to rehabilitate any disturbed areas following completion of the works. The Rehabilitation Contractor may also be required to water rehabilitated areas with non-potable water, following planting, to ensure sufficient establishment of vegetation. - Hydroseeding with a mix of indigenous grass seed (suitable for rehabilitation), at an application rate of 15-20kg/ha, may be used to rehabilitate disturbed areas outside of protected or conservation areas, or areas containing indigenous vegetation/veld. Grassing with indigenous grass sods, may also be utilised in the same situations. A nitrogen fertilizer, such as 3N:2P:1K, may	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			be applied at an applicable rate (e.g., 150kg/ha) for both hydroseeding and sods. Once rehabilitation is done, no contractor should be allowed to disturb the rehabilitated area.	
5.6.9 Topsoil Management	- Runoff laden with fine sediments from stockpile areas entering surrounding sensitive habitats. - Loss of seed viability. - Erosion of topsoil. - Weed contamination and spreading of alien plants due to disturbance.	Low to High	- Areas requiring topsoil clearance shall be approved by the ECO and relevant management authority prior to the commencement and work. - Following any S&R of indigenous vegetation, the topsoil shall be cleared to a depth of ~150mm. - Topsoil shall be stored in areas approved by the ECO and the relevant management authority, at location where it will not be disturbed during the proposed activities. - The Contractor shall ensure that minimal amounts of topsoil is lost due to erosion, either by wind or water, and that such stockpiles shall be covered with shade netting or hessian, if not replaced within two weeks. - The stockpiling and replacement of the topsoil shall be done under the supervision of the Rehabilitation Contractor. - Following the clearance of topsoil, the remaining areas of the site may be cleared and grubbed with all exotic vegetation disposed of at a licensed WDF.	
5.6.10 Earthworks	- Impacts depend on the extent of vegetation clearing. - Increased sedimentation in sensitive areas, such as wetlands, riparian areas and instream channels, thus reducing habitat	Low to High	- Where required, excavation footprints are to be surveyed and pegged. - Each site shall be demarcated by means of a boundary fence with a barrier netting as a minimum requirement, and all activity restricted within this area.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	quality due to smothering of these habitats. • Damage to riparian, instream and/or wetland vegetation when accessing working area and conducting the maintenance activity.		• The excavated subsoil shall be stockpiled at designated stockpile areas and shall not be mixed with the topsoil material. • Open excavations shall be appropriately demarcated and shored, where required, to minimise the risk to all persons within and around the excavations. • No persons shall enter the excavations without permission to do so. • Open excavations shall be demarcated with warning signs, and checked at regular intervals to ensure no fauna has fallen into them. • Upon completion of excavation activities, backfilling shall be done using the existing excavated soil next to the excavation and be mechanically compacted.	
5.6.11 Dewatering of Trenches and Excavations	• Pollution and/or sedimentation of adjacent and/or downstream habitats. • Obstruction or diversion of surface flow during repair work. This could lead to a loss of connectivity within a river or wetland or erosion in an area receiving diverted flow. • Long-term, potentially irreversible changes to soil structure and soil chemistry leading to vegetation die-off, changes to plant community structure, favouring weedy species, and possible erosion	Low to High	• Active dewatering of ground or surface water from excavations shall be undertaken as required. • Where required, sandbags may be packed within trenches and/or excavations to dam any subsurface or surface water entering the trench and/or excavation. A dewatering pump may then be placed in the trench or excavation and the water pumped via a layflat into the most appropriate location, which could include a nearby stormwater drain (if consent from Council is received), dam, or vegetation etc., as approved by the ECO and the relevant management authority. • A coarse screen shall be installed at the pump inlet to remove coarse particles. • Where fines are present, the water shall be conveyed through a pipe into stitched geofabric bags to retain any sediment/fines before discharge of the water. These	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			bags shall be placed on disturbed dryland areas and the water shall be allowed to dissipate into the environment. • The sediment filled bags shall be left in place to dry out, after which they shall be removed off site for disposal by the Contractor. • In the absence of fines, the Contractor may install a diffusion plate, or the like, to minimise erosion. • Where technical trenching takes place directly downstream of a culvert/outlet/stream/drainage channel, the upstream inlet shall be blocked in order to pump the water directly over the road or divert by pipe through the culvert, across the trench and into the downstream channel or stream during trench excavations. • Flow through the culvert or pipes shall again be reinstated once the trench has been backfilled and closed. • Alternatively, water from dewatering may be pumped into a water truck, which can then use the water for dust suppression on nearby access roads or can discharge at a nearby WWTWs, if so approved. • If the above is not feasible, alternative dewatering methods and sites shall be discussed with the botanist, Rehabilitation Contractor, ECO and the relevant management authority.	
5.6.12 Construction Water	Pollution of aquatic ecosystems and possible accumulation of toxicants resulting in reduced habitat quality for aquatic fauna and flora.	<u>Medium to High</u>	• Only non-potable water may be used during construction for activities such as dust suppression, concrete mixing and pipe pressure testing. Such may be purchased from a nearby WWTW. • Water shall not be pumped from, or be allowed to flow into, wetlands, rivers or streams	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
5.6.13 Pressure Testing	Pollution and/or sedimentation of adjacent and/or downstream habitats	Low to Medium	• Uncontaminated water discharged during pressure testing shall be discharged via a layflat into the most appropriate location (approved by ECO and the relevant management authority), which could include a nearby stormwater drain (if consent from Council is received), dam or vegetation, etc. • Where necessary, measures shall be put in place to prevent the discharged water from impacting nearby sensitive sites, such as utilising sandbags and berms. • Applicable measures to control erosion shall be put in place.	
5.6.14 Pumping of production boreholes to waste	Pollution and/or sedimentation of adjacent and/or downstream habitats	Low to Medium	• When it is required to discharge water from boreholes for extended periods of time, this should be done by connecting a layflat to the scour outlet point outside the borehole cage and running the layflat to an appropriate pipeline manhole. • Ensure that the layflat hose and fittings are secured to prevent leaks or disconnection. • Place a shade cloth over the discharge manhole opening to prevent fauna from falling in. • Pumping must commence with just one borehole, following which additional boreholes may be added incrementally. Should any leaks or disconnections occur at any point during the discharge, the pumping should be stopped, and leaks should be repaired and/or pipes reconnected. • Daily visual inspection during discharge must be undertaken to confirm: • No standing water or pooling within the surrounding environment.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			- No leaks, pipe ruptures, or disconnections have occurred. - Barrier fencing is in place and no fauna has entered the working area. - Should there be any erosion from leaks or pipe disconnection, the relevant landowner or management authority should be consulted to advise on rehabilitation.	
5.6.15 Temporary Stockpile Areas	- Runoff of silt-laden water into sensitive areas. - Destruction of vegetation in stockpile areas, which then leads to local erosion and downstream or downslope sedimentation. - Establishment and encroachment of invasive alien plants into the surrounding landscape. - Creation of concentrated surface flowpaths and subsequent erosion. - Poor recovery - Changes to plant community structure - Loss of biodiversity - Undesirable weeds - Introduction of invasive alien plant seeds/seedlings, compaction of soils and shading of indigenous plants.	Low to Medium	- The location of temporary stockpile areas shall be approved by the ECO and the relevant management authority. - The temporary stockpile areas shall be located outside of wetland areas and away from streams, where such are present. - Natural wash or flow of surface water leading onto the stockpile site shall be diverted away from the stockpile site. - Wash or flow from the stockpile site shall be contained. Sandbags, eco-logs, and/or sediment fences should be used to prevent erosion of stockpiled materials into the surrounding environment. - Temporary stockpile areas shall be cleared of topsoil where deemed necessary by the ECO.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
5.6.16 Erosion and Sediment Management	• Loss of vegetation. • Disturbance of river or wetland habitat during removal of sediment. • Destabilisation of slopes, banks and beds of wetlands and rivers, leading to increased mobility of sediments into sensitive areas. • Increased sedimentation in sensitive areas, such as wetlands, riparian areas and channels. • Smothering of cobble, boulder and bedrock habitat in rivers. • Smothering of wetland substrates.	Low to Medium	• Erosion shall be prevented during various activities, including pump testing, pressure testing, and dewatering of trenches etc. • Water shall be pumped via a layflat to the most appropriate location/s, which could include a nearby stormwater drain (if consent from Council received), dam or vegetation etc. • A steel plate may be placed at the exit of the layflat pipe to diffuse flow of water and prevent erosion. • Alternatively, the use of a manifold shall be used to create sheet flow, or a perforated layflat shall be used to spread the water. • The end of the layflat shall also be moved regularly to prevent erosion patterns forming and to prevent flooding of one area. • Where necessary, sandbags and berms shall be used to prevent water from entering sensitive ecosystems and to focus drainage into soft sands around the site/s. • The discharge point shall be relocated if localised flooding causes visible disturbance to local populations of burrowing creatures. • The Contractor shall protect areas susceptible to erosion by installing necessary temporary drainage works as soon as possible and by taking other measures to prevent the surface water from being concentrated in streams and from scouring slopes, banks or other areas. • Areas that are vulnerable to erosion shall be demarcated with barricading and shade netting to prevent erosion and any sediment from flushing into the surrounding environment during rain events.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			- Any runnels or erosion channels developed during the maintenance period or during the vegetation establishment period shall be backfilled and compacted, and the areas restored to the satisfaction of the ECO. - Access roads (e.g., dirt or jeep tracks) used by the Contractor shall be inspected daily to identify any risk of erosion concern along the tracks. Should any erosion risk occur. The ECO should be notified and corrective action taken. - Hessian cloth and hessian sandbags can be used to stabilise eroded areas and with the rehabilitation thereof.	
5.6.17 Stormwater Management	Increased sedimentation in sensitive areas, such as wetlands, riparian areas and instream channels, thus reducing habitat quality due to smothering of these habitats.	Medium to High	- The existing stormwater drainage (roadside drains and stormwater pipes) along the working areas must be maintained to ensure that they are functioning (e.g., not blocked). This will reduce water run-off from entering the excavations which could cause erosion or sediment-laden water from entering watercourses and wetlands downstream. - The Contractor shall take reasonable measures to control the erosive effects of stormwater runoff, which may include the use of silt screens and/or filters to prevent overland flowing water from causing erosion. - The use of sandbags wrapped in geotextile material (or the like) as filters, may be placed across overland stormwater flows as an erosion protection measure. - The Contractor shall be liable for any damage to downstream property or watercourses caused by the diversion of overland stormwater flows.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
5.6.18 Heritage Resources	<u>Heritage</u> Should any heritage resources, including evidence of graves and human burials, or archaeological material be discovered during the execution of the maintenance activities, works must be stopped immediately and Heritage Western Cape must be notified without delay.	<u>Heritage</u> Very low	• In the event that an object of heritage, archaeological or paleontological origin is discovered, the activity in the area shall be stopped. • The site personnel shall then be informed that the area is a no-go area, and the ECO shall be informed. • The ECO shall then engage with Heritage Western Cape to advise on the way forward.	
5.6.19 Noise Control	Disturbance of flora and fauna through noise and light pollution during working hours	Negligible	• All construction related works shall endeavour be undertaken during normal prescribed/agreed daylight hours, within prescribed limits. • Noise levels exceeding 85dB shall only be permitted where approved by the ECO and the relevant management authority, or during an emergency situation. • The use of temporary noise reduction barriers (e.g., straw bales, walls constructed of carpet or foam) can be used to help mitigate noise levels near residential housing. No straw/hay bales (or anything that could carry the risk of introducing invasive alien weeds and grasses) may be used within any protected area.	
5.6.20 Dust Management	• Dust covering vegetation • Discharge of dust suppression water into wetlands and rivers, causing deterioration in water quality, such as through increased turbidity, nutrient loading, introduction of high levels of iron	Low	• Mitigations for dust suppression (e.g., using a water truck on access roads) shall be used on site, if required, to reduce dust generation during hot and/or windy conditions. • The Contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the ECO.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	and magnesium in groundwater, etc.		• Removal of vegetation shall be avoided until such is required, and similarly exposed surfaces shall be revegetated or stabilised as soon as is practically possible. • Excavation, handling and transport of erodible materials shall be avoided under high wind conditions or when a visible dust plume is present. During high wind conditions, the ECO shall make recommendations as to whether dust-damping measures are adequate, or whether work will cease altogether until wind speed drops to an acceptable level. • Where possible, soil stockpiles shall be located in sheltered areas where they are not exposed to the erosive effects of the wind. Where erosion of stockpiles becomes a problem, erosion control measure shall be implemented at the discretion of the ECO. • Appropriate dust suppression measures shall be used when dust generation is unavoidable, e.g. dampening with water, particularly during prolonged periods of dry weather in the summer. The use of other measures such as soil binders, straw, brush packs, chipping, etc., shall first be approved by the ECO and relevant management authority, prior to use. • Care shall be taken not to wet roads over bridges/watercourses (e.g., not watering 10m on either side of such) to limit the volume of groundwater entering terrestrial watercourses.	
5.6.21 Concrete and Cement Handling	• Change in soil pH to more alkaline. • Pollution of rivers and wetlands resulting from the discharge of	Low to Medium	• Preference shall be given to the use of ready-mix concrete. Plastic sheeting and/or plywood boards shall be placed under the chutes of the concrete truck to minimise spillages. Concrete shall be discharged directly	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	construction-related pollutants, such as cement, into these sensitive ecosystems. Introduction of cement/concrete can alter the pH of the water, and cause smothering of habitat, fauna and flora.		from concrete truck into the formwork where possible. For areas where the truck is unable to reach, the concrete shall be discharged directly into the bucket of the tracked excavator and/or TLB digger loader. The concrete shall be finished as to the requirements stipulated in the structural design and cured accordingly. • If small quantities of concrete batching are required, such shall be done next to the relevant structure being constructed. Plastic shall be laid on the ground and a wooden board shall be used on which mixing shall occur. A berm shall be created around the plastic to contain any run-off material. All contained run-off shall be controlled and disposed of as builders rubble once dried. Cement bags shall be stored in containers or on plastic. • The batching of concrete or mortar shall not be done on windy days to reduce windblown cement entering the natural environment. Should the batching of concrete or mortar need to be done on a windy day, then the batching area shall be equipped (e.g., with fabric sheet walls) to prevent any cement dust from blowing away. • No plant or equipment is allowed to be washed in, or near, any watercourse, wetland or other surface water. Trucks shall be cleaned at the supplier's yard. Any tools or equipment that require cleaning shall be cleaned at one fixed location at the site camp. This shall be agreed with and approved by the ECO. A bunded area that is sloped, lined with 250-micron DPC plastic covered with sand, shall be constructed. Any wastage and water run-off resulting from this cleaning process shall be contained in this wash area. This wash area shall be	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			cleaned regularly or as required and the waste shall be disposed off-site. Any visible spillages shall be removed immediately from the site area. Excess concrete shall be stored in a skip and disposed of as builders' rubble.	
5.6.22 Waste Management	- Proliferation of exotic or undesired species due to high nutrient loads. - Litter spreading into sensitive areas, such as riparian areas, wetlands and channels. - Dumping of waste/construction material into aquatic ecosystems would result in the loss of habitat. - Runoff from designated waste sites may result in pollution of aquatic ecosystems.	Low to Medium	- Solid waste shall be stored in clearly labelled animal-proof bins and regularly disposed of and cleaned offsite as necessary. Waste management on site will include regular clean-ups (at least once daily) around the construction and camp sites, and a record of all waste removal and disposal slips shall be maintained. On completion of the works, a search for any litter on site and in the immediate surrounds shall be conducted. - Eating areas shall be provided for workers with signs indicating general waste bins. - Fuel contaminated soil shall be stored in clearly marked waterproof containers with lids or in spill bags. - Cement bags shall be kept separately in a designated enclosed area to prevent contamination of storm water and run-off. - The waste shall be disposed of at a suitable WDF (e.g., hazardous waste at the Vissershok WDF). No burning/burying of waste shall occur on site. Certificates of disposal shall be kept on file on site. - Waste recycling shall be explained in toolbox talks to encourage recycling at the workplace and at home.	
5.6.23 Contaminated Water	- Die-off of indigenous wetland vegetation. - Proliferation of exotic or undesired species.	Low to Medium	The Contractor shall prevent the discharge of any pollutants, such as cements, concrete, lime, chemicals and fuels into any water sources.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			- Approval by the ECO and Local Authority shall be required prior to the discharge of any water to the Municipal sewer/storm water system. - Run-off from fuel depots/workshops/truck washing areas and concrete swills shall be contained (e.g., in a conservancy tank) and disposed of at a site approved by the ECO and Local Authority.	
5.6.24 Ablutions	- Proliferation of exotic or undesired species due to higher nutrient loads. - Pollution of wetlands and rivers through leaks or spills from installed toilets. - Pollution of wetlands and rivers as the result of deposition of human waste.	Low to Medium	- Chemical toilets shall be available at the site camp and close to the construction sites. The ablutions shall be located outside of wetlands and away from streams, where such are present. These facilities shall be secured to prevent toppling and spillages into the environment. - Regular removal of chemical toilet content shall be done by a registered contractor and disposal slips shall be available on site for inspection. - Wild animals must not have access into these facilities. - Toilet facilities supplied by the Contractor for the workers shall occur at a maximum ration of 1 toilet per 30 workers (preferred 1:15). - Sanitation facilities shall be located within 100m from any work location, but not closer than 50m to any water body.	
5.6.25 Fire Prevention and Management	An increased fire frequency that exceeds the average acceptable burn interval (which ranges from 8 to 15 years in Fynbos) would lead to impacts that become more severe as fire intervals shorten in consecutive events. This is far	Negligible (under a well-timed, acceptable burn cycle) to High (under frequent, short-interval fires).	All employees and site personnel shall be informed and made aware of the dangers associated with smoke/fire. No cooking or open fires shall be permitted on site. Smoking shall only be permitted in designated smoking areas, with cigarette butts collected and disposed of with the general waste stream. Smoking is not allowed in the area where fuel handling, storage or refuelling occur.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	more detrimental than longer intervals or lower fire frequency. • Destruction of vegetation through accidental fires. • Removal of vegetation cover, leading to erosion and sedimentation.		• An appropriate number of serviced fire extinguishers and fire beaters shall be provided in all working areas. Personnel on site shall be trained in the operation of the fire equipment in order to contain a fire as fast as possible. • A designated fire marshal shall be tasked with reporting and/or liaising with Incident Command and/or the relevant management authority, should a fire be identified in the area or on site. • Should evacuation be called, key escape routes have been mapped, and personnel will be evacuated to the contractor's main site camp, if safe to do so, and roll call will be taken to ensure that all are accounted for and safe. The contractor shall abide by the instructions given by the Incident Command and/or the relevant management authority and shall only return to site once given permission to do so. No emergency brush cutting for the purposes of fire management are permitted without prior approval of the Incident Command or the relevant management authority.	
5.6.26 Hot works	As above.	As above.	• Any welding or other hot work shall be undertaken with the necessary safety equipment, i.e., welding screens and functional/serviced fire extinguishers. • Designated staff shall have the appropriate training to operate fire extinguishers and put out fires safely and quickly. • Hot work shall only take place in conditions which are safe. The Cape Peninsula Fire Protection Association releases daily fire danger ratings. If the danger ratings are orange or red, then no hot work may take place.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			The Contractor shall communicate fire danger ratings to the ECO prior to commencing with hot works.	
5.6.27 Hazardous Chemical Management	- Pollution of wetlands and rivers through accidental spills. - Long-term, potentially irreversible changes to soil structure and soil chemistry leading to vegetation die-off, changes to plant community structure, favouring weedy species, and possible erosion.	Low to High	- The only hazardous materials on site may include fuels, oils, paints, epoxy, cement and acids, etc. (e.g., sulphamic acid for borehole rehabilitation). All hazardous building materials shall be dealt with in accordance with the relevant Safety and Environmental Legislation. All hazardous chemicals shall be stored in contained areas to prevent spills, and spill kits and fire extinguishers shall be available wherever hazardous chemicals or fuel are stored or used. All hazardous substances shall be stored in the store container with properly displayed and visible warning signs. - The Material Safety Data Sheets (MSDS) for all hazardous chemicals shall be kept on file onsite. Hazardous materials shall be handled as per each product's MSDS. All staff required to handle and use such hazardous substances shall receive adequate training. - Hazardous waste and waste fuels and oils shall be stored in appropriate containers that will not corrode or leak. These containers shall be properly marked to indicate contents. Drip trays shall be placed under all plants and machinery using hazardous chemicals as well as under containers of hazardous materials being used on site. - All hazardous material/waste shall be separated on site and disposed of at a licensed WDF, with proof thereof retained.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
5.6.28 Hydrocarbon Management	• Pollution of wetlands and rivers through accidental spills. • Long-term, potentially irreversible changes to soil structure and soil chemistry leading to vegetation die-off, changes to plant community structure, favouring weedy species, and possible erosion	Low to High	• Surfaces, where the possibility of hydrocarbon spillage exists, shall be prepared in such a way as to mitigate these risks. Drip trays will be placed under all parked or stationary plant. Drip trays to be cleaned out if there is any spill with spill kits, and hazardous waste disposed of licenced WDF, with proof thereof retained. Small quantities of fuel to be stored in the store container at the end of every shift and site securities shall be equipped with fire extinguishers. • Mitigation in the form of plastic sheeting in conjunction with large high walled drip trays shall be used during refuelling activities and for vehicles/equipment that are kept in one place for longer than 3 days. Each refuelling, or storage site shall be in possession of a chemical/hydrocarbon spill kit and fire extinguisher. The machine/plant shall be switched off when filled. • Machinery prone to oil or fuel leakage must be located at least 50 m away from the edge of any watercourse or wetland, and the area adequately bunded in order to contain leakages. • Inspections and check lists shall be done on machines and leaks shall be reported to the Site Manager/ Site Supervisor. Any vehicle or equipment that is leaking hydrocarbons shall not be used until it is repaired, or it shall be removed from site.	
5.6.29 Emergency Spill Procedures	• Pollution of wetlands and rivers through accidental spills. • Long-term, potentially irreversible changes to soil structure and soil chemistry leading to vegetation die-off, changes to plant	Low to High	• All employees and site personnel shall be informed and made aware of the emergency procedures in the form of a toolbox talk, for handling spills of hydrocarbons, chemicals or contaminated water (including water containing sediment/fines).	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
	community structure, favouring weedy species, and possible erosion.		• Telephone numbers of emergency services shall be posted at the site office and in all site vehicles. Team leaders shall have the emergency services' telephone numbers stored in their cell phones. • Materials and equipment necessary for dealing with spills and leaks (such as spill kits and stockpiled sandbags) shall be obtained for the site as required. For example, a 200 ℓ spill kit will be kept on site for dealing with a spill of that size. If any spill larger than 200 ℓ occurs, then a specialist contractor (e.g., Spill Tech or EnviroServ) shall be contacted to handle the larger spill. The relevant MSDS will be available on site. A drip tray will be placed under the mobile fuel bowser when on site. If a spill should occur, the following will be actioned: • The ECO, relevant management authority and/or Local Authority shall be notified of the incident. • All machinery shall immediately be removed from the area. • The contaminated area shall be demarcated and kept clear of any traffic. • Spillages shall be cleaned with a spill kit and the contaminated material shall be removed from site and disposed of at licenced WDF. • Proof of legal disposal will be kept on site for inspection. • The Contactor and ECO shall compile an incident report to document the incident.	
5.6.30 Temporary Site Closure	N/A	N/A	• During temporary closures, the site and all equipment shall be secured. • There shall be no excavations left open during temporary closures. If an excavation must be left open during a	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			temporary closure, then the Contractor shall designate a reliable person to check the excavation on a regular basis for the presence of animals and for the need to de-water (especially after rainfall). The ECO shall check the site prior to the site's temporary closure.	
5.6.31 Working Hours and Accommodation	Disturbance of flora and fauna through noise and light pollution during working hours	Low	- Work shall take place during daylight hours, unless approved in writing by the ECO and the relevant management authority. Site employees shall be accommodated off-site and transported by a suitable vehicle every day, with food provided during the day which has been prepared at the staff camp and heated prior to it being taken to site from the site offices at lunchtime. - If lights must be used at night, these shall be directed away from wetlands and rivers.	
5.6.32 Site Remediation and Rehabilitation	- Persistence of unvegetated or unstable areas if rehabilitation not done to plan. - Poor recovery - Undesirable weeds	Low to Medium	- All offices, structures, machinery and equipment shall be removed from site and the site returned to a state equal to or better than that in which it was found. - Topsoil shall be returned to disturbed terrestrial areas (including stockpile areas) to assist in the rehabilitation of and stabilisation thereof. Such shall be undertaken under the supervision of the Rehabilitation Contractor. The Rehabilitation Contractor shall also undertake any reseedling or replanting of vegetation removed during Search and Rescue and undertake follow up thereof to ensure adequate cover of indigenous vegetation and clearance or re-emerging alien invasive vegetation. The use of an indigenous grass seed mix or sods may also be considered for stabilising areas that require mowing.	

Actions	Potential impacts of these actions	Severity of impacts	Measures to mitigate the severity of these impacts	Corrective/remedial measures if mitigation measures are not properly implemented
			Should the rehabilitation of any areas beyond the demarcated site be necessary because of contractual non-compliances by the Contractor, these shall be dealt with in terms of the rectification measures deemed necessary by the ECO, and if necessary the botanical and/or freshwater ecologist.	

6 ENVIRONMENTAL MONITORING AND REPORTING / AUDITING

The development of an EMMP for a project is an important task that is aimed at assigning responsibilities and mitigation options to a variety of activities. However, it can be an ineffective tool in the absence of auditing or monitoring activities. Auditing, inspections or monitoring activities involve the structured observation, measurement, and evaluation of environmental data over a period of time.

- The overall responsibility to ensure that the EMMP is implemented rests with the Proponent, who shall appoint appropriate engineering, environmental and contracting teams to undertake the work.
- The ECO shall inspect the site prior to any site clearing activities commencing in preparation of reconstruction activities; at least once (1) a week during the reconstruction phase; and on completion of the reconstruction work.
- The ECO shall report on the level of compliance with this EMMP to the Proponent and to the relevant authorities.
- Relevant specialists shall be commissioned to undertake a site visit to the Wellfield annually after the winter rains, in order to monitor key areas of concern. A short monitoring report will be prepared for the Table Mountain Group Aquifer Monitoring Committee on an annual basis.

6.1 Disciplinary action

The EMMP is a legally binding document. Non-compliance with the EMMP shall result in disciplinary action being taken against the perpetrator/s. Such action may take the form of (but is not limited to) financial penalties, legal action, fines, stop work and rehabilitate at own cost, and/or dismissal.

A variety of legislation dictates behaviour/action associated with environmental management and identifies suitable action in the event of non-compliance. That which is to be considered in the event of non-compliance or contravention of the EMMP, includes:

- The National Environmental Management Act (No.107 of 1998)
- The National Water Act (No. 36 of 1998)
- The Occupational Health and Safety Act (No. 85 of 1993)

The Contractor shall be deemed to have not complied with the EMMP if:

- Within the boundaries of the site there is evidence of contravention of the EMMP, Method Statement and its associated reports.
- Environmental damage ensues due to negligence.
- The Contractor fails to comply with corrective or other instructions issued by the ECO, DFFE or delegated CCT official within a specified time (maximum two weeks).
- The Contractor fails to respond adequately to complaints from the public.

The disciplinary action shall be determined according to the nature of the non-compliance or crime, and exact penalties determined by the Proponent (on advice by the ECO and/or CCT designated official) where penalties are being applied in terms of the Environmental Specification of a contract. If the Contractor is being prosecuted by the DFFE or DWS in terms of the NEMA or NWA, then the courts will apply penalties in terms of such legislation, taking into account the severity of the incident.

7 References

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In diversity there is beauty and there is strength.

MAYA ANGELOU

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